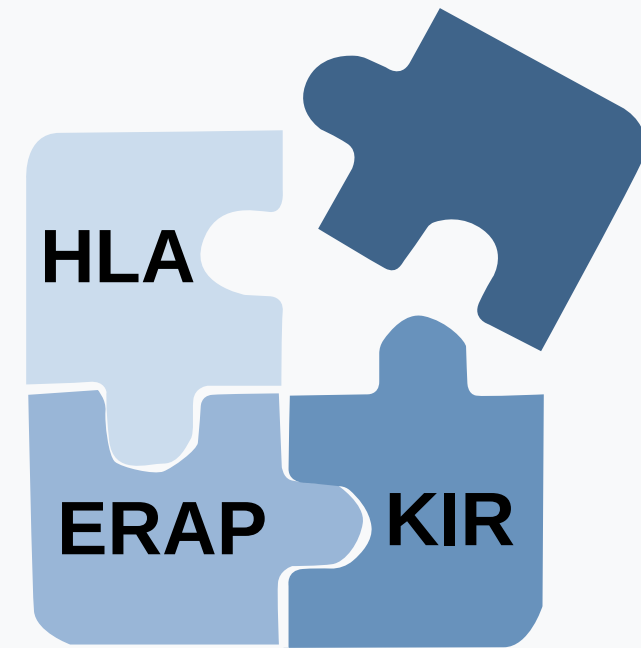

Research Opportunities

Matt Krantz, MD, MS

Assistant Professor of Medicine

Vanderbilt University Medical Center



Funding:

Supported by the:

- **NIH/NIAID (K08 AI185260)**
- **AAAAI Foundation Faculty Development Award**

Mentored by:

Elizabeth Phillips, MD

Director, Center for Drug Safety and Immunology

The Central Question

Why don't all carriers of human leukocyte antigen (HLA) associated risk alleles develop drug hypersensitivity and allergic diseases?

The Approach

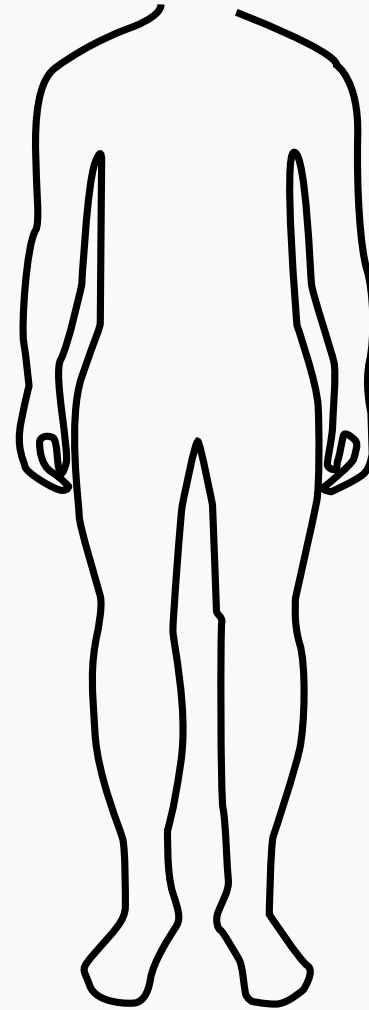
Can electronic health record (EHR)-linked biobanks be used to uncover the incomplete penetrance of HLA risk alleles for drug hypersensitivity and allergic diseases?

Disease Focus

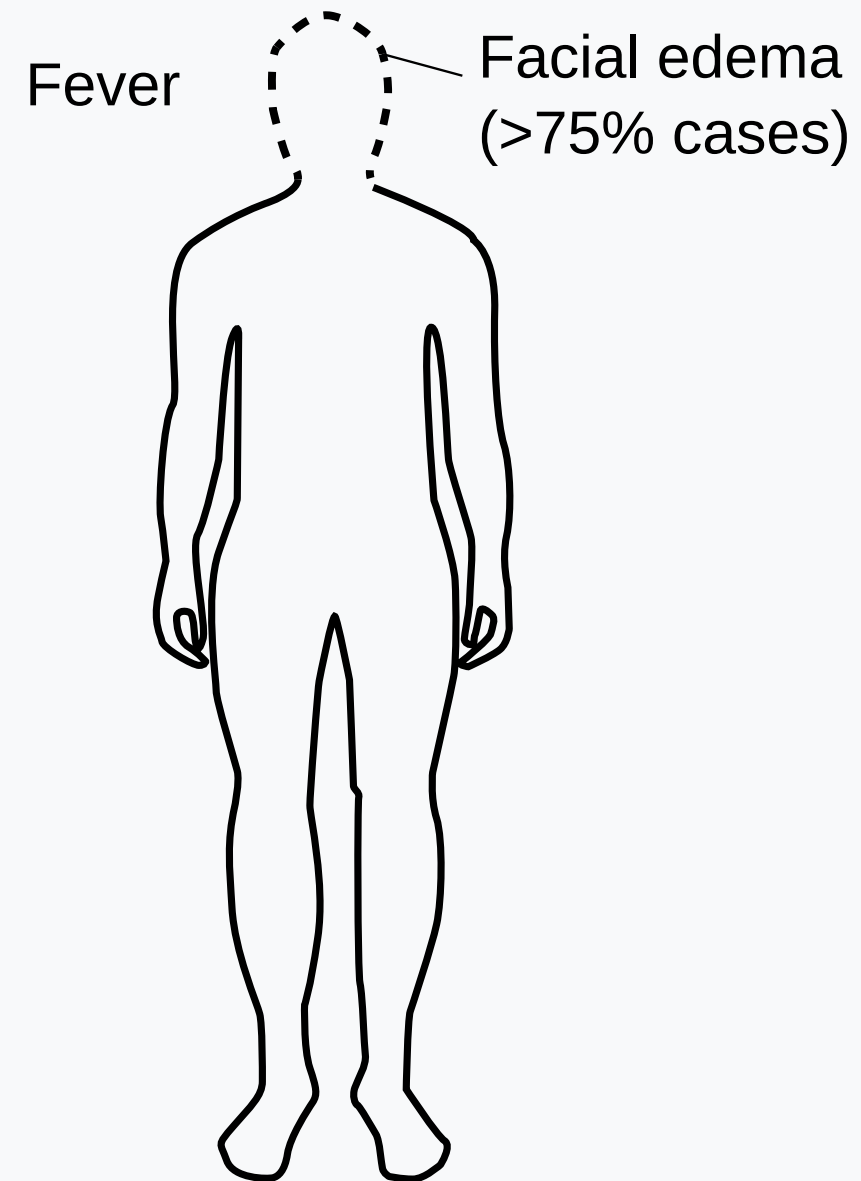
HLA-A*32:01 associated vancomycin drug reaction with eosinophilia and systemic symptoms (DRESS)

DRESS symptoms

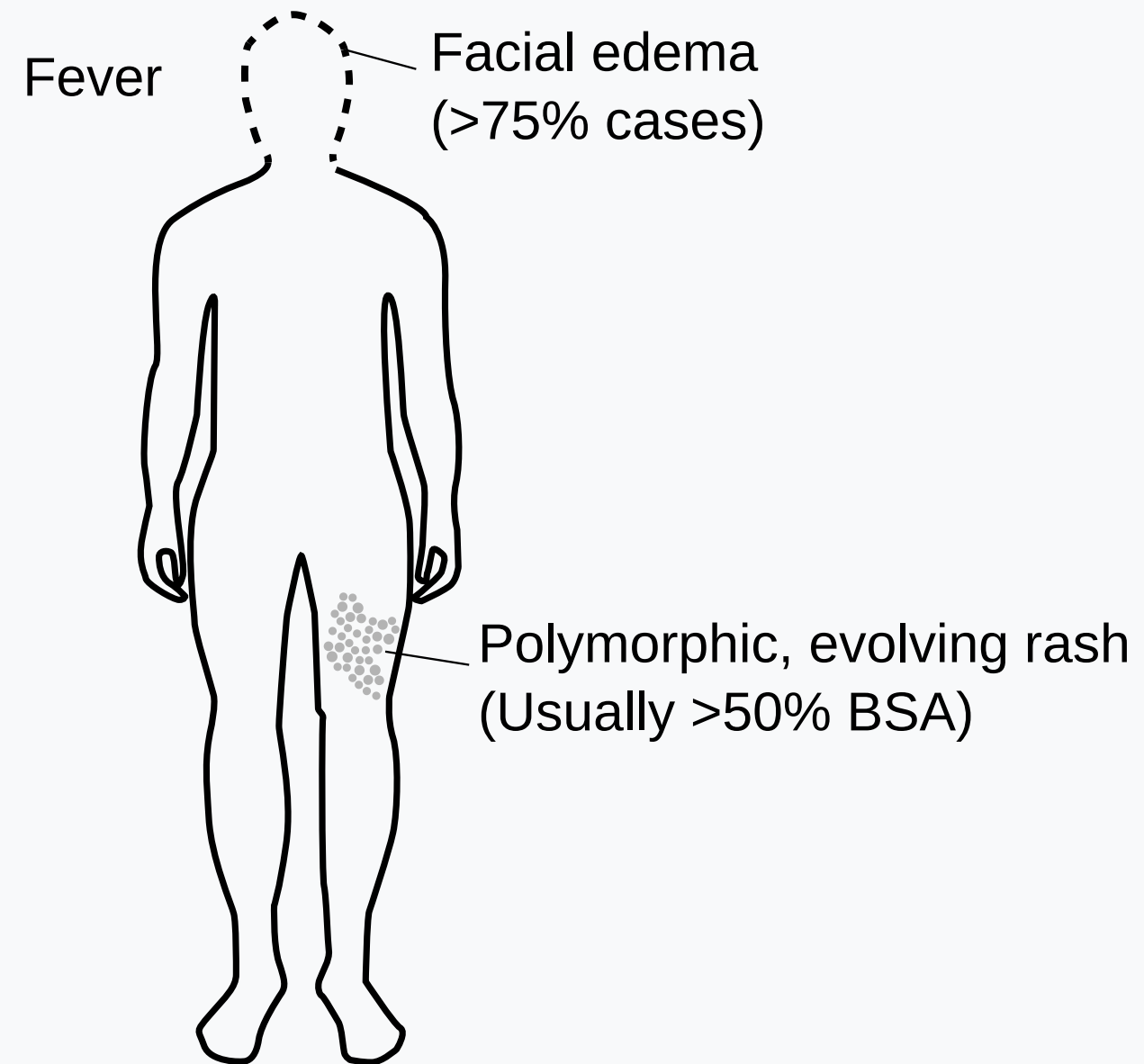
Fever



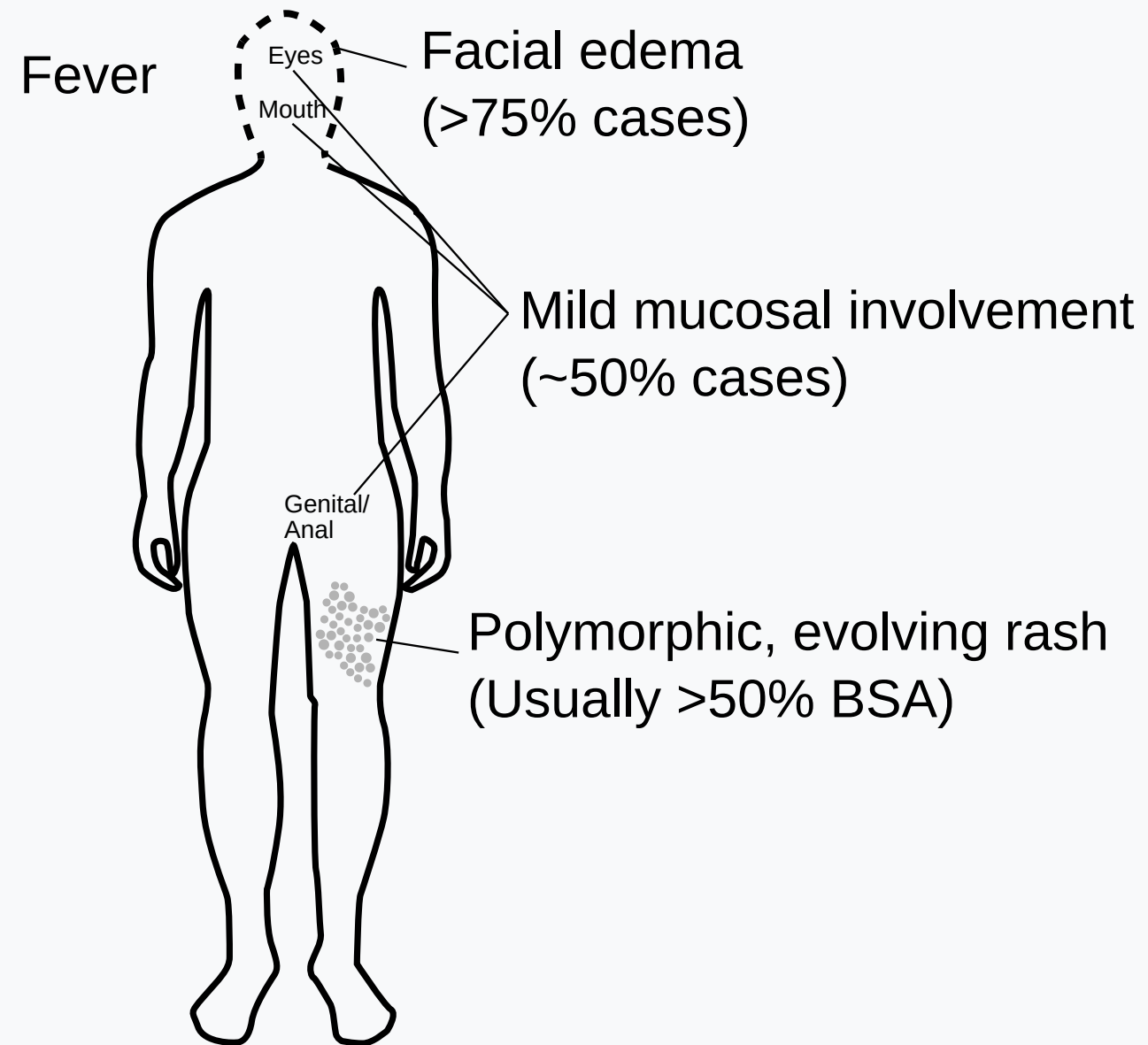
DRESS symptoms



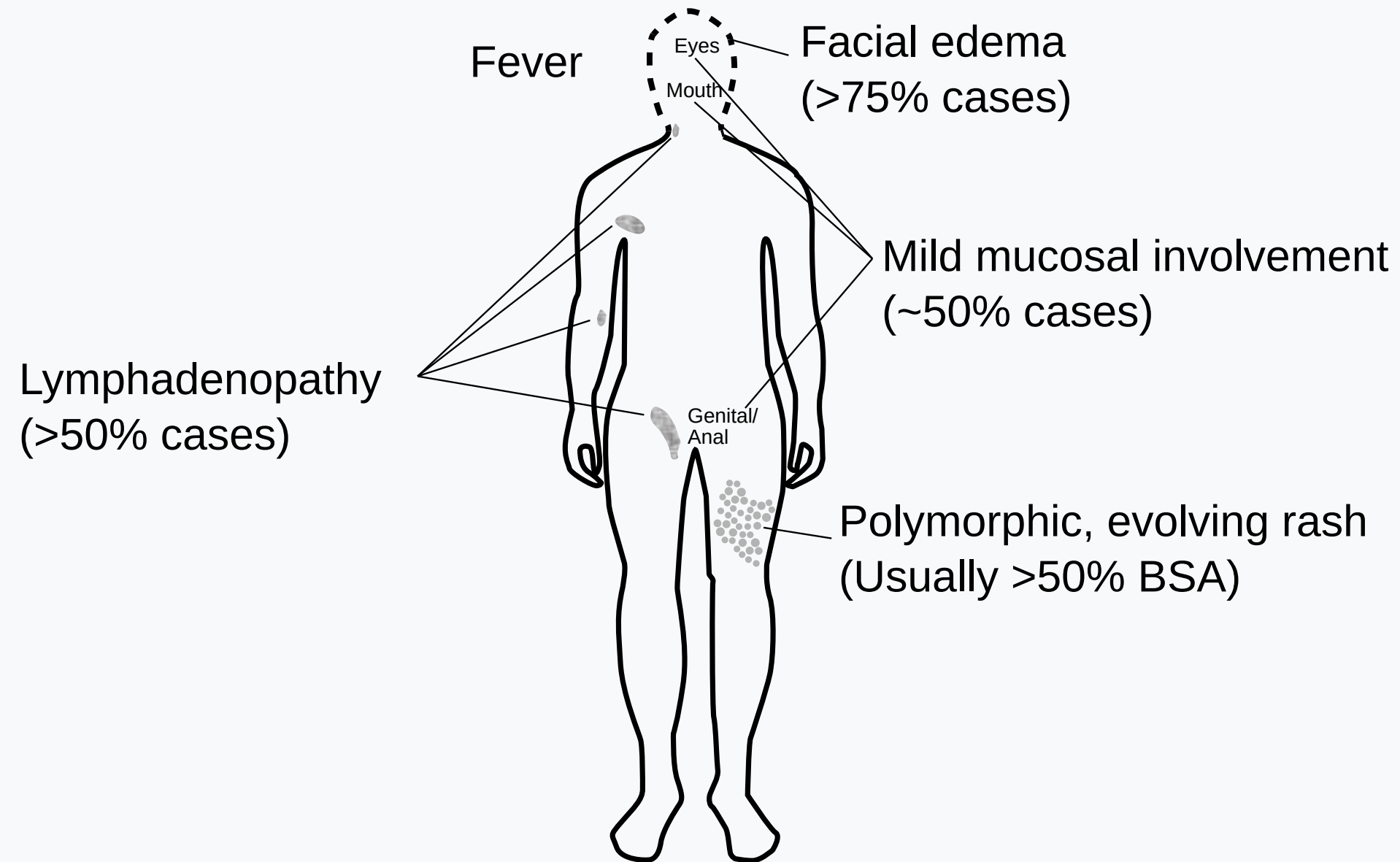
DRESS symptoms



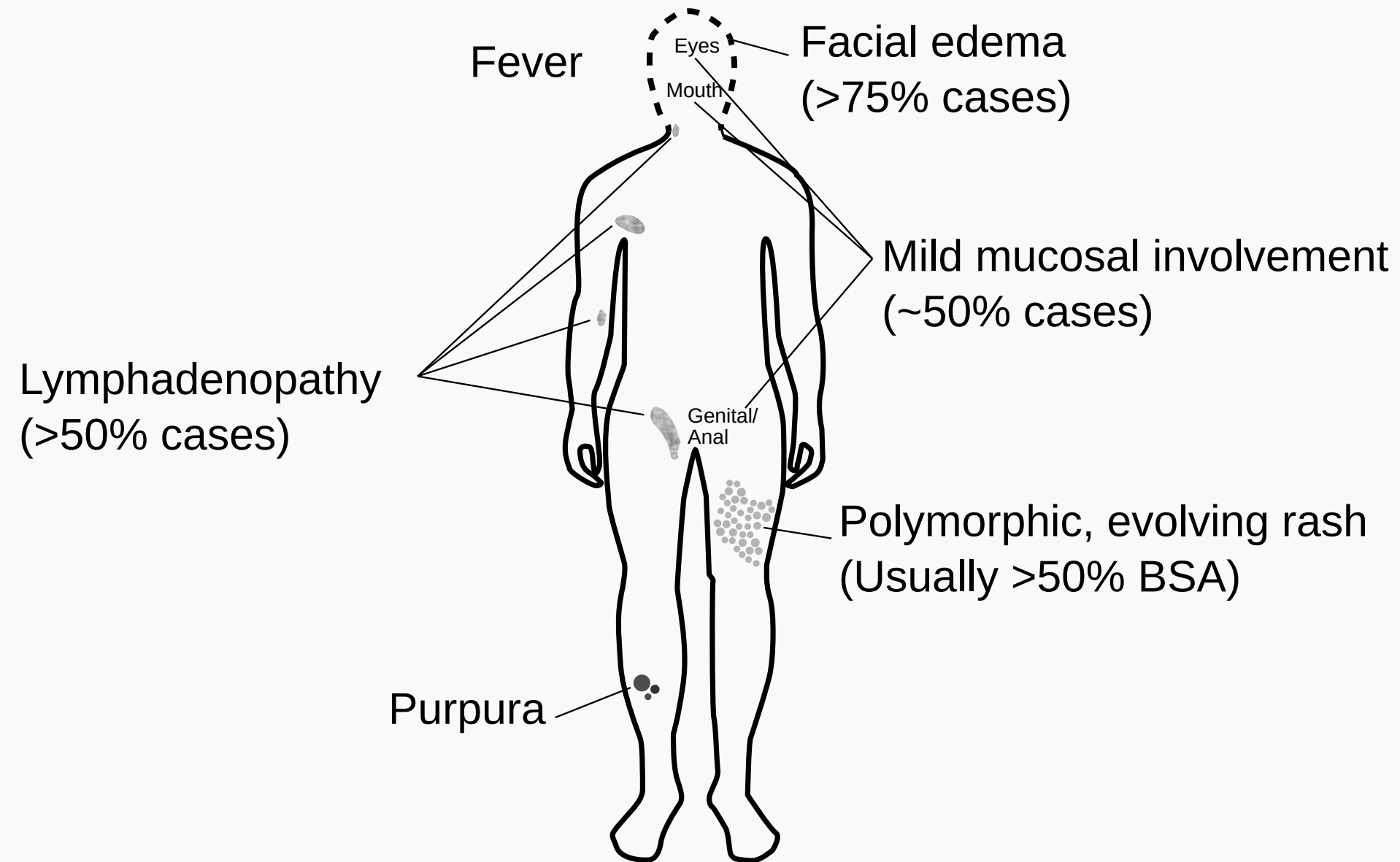
DRESS symptoms



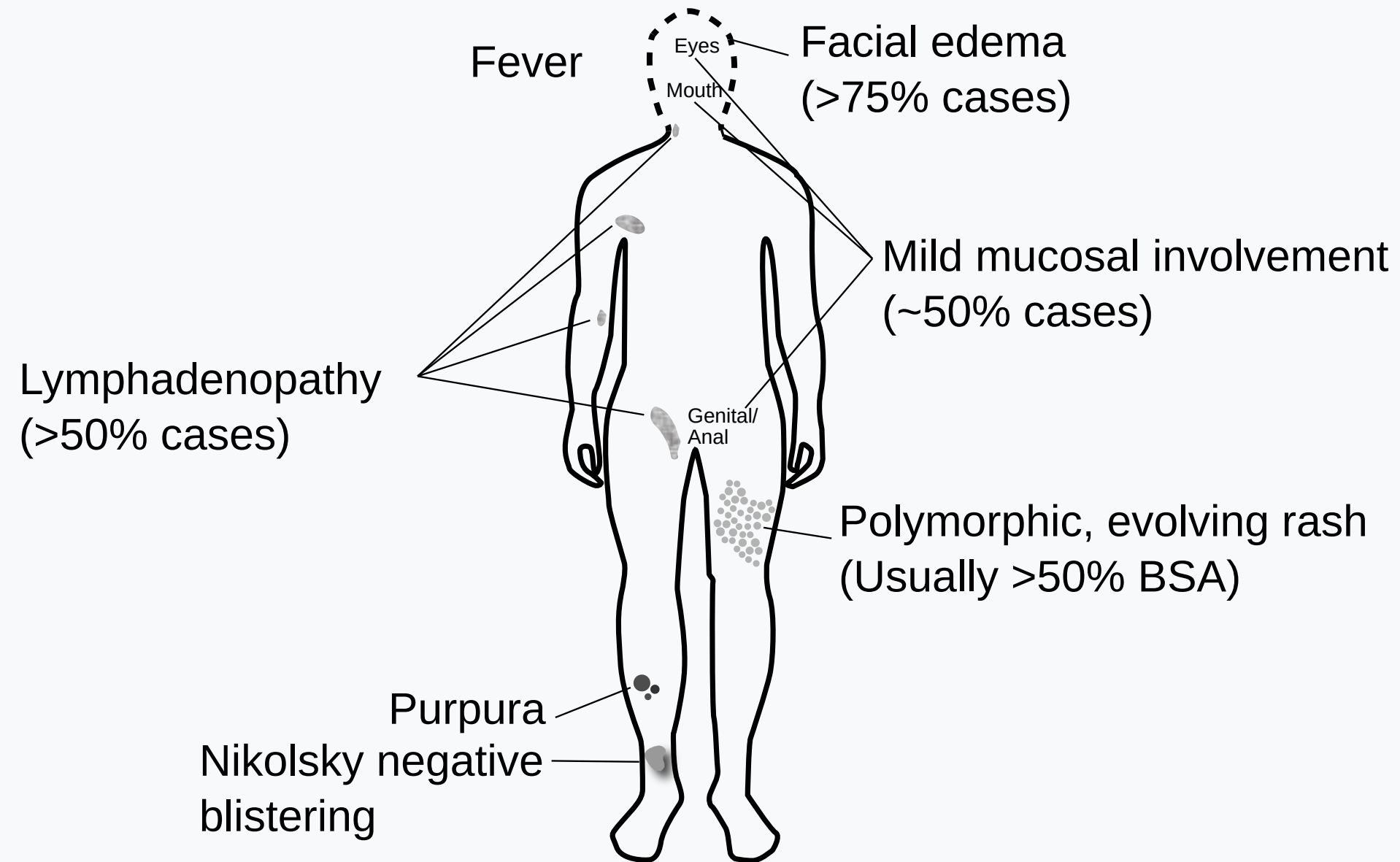
DRESS symptoms



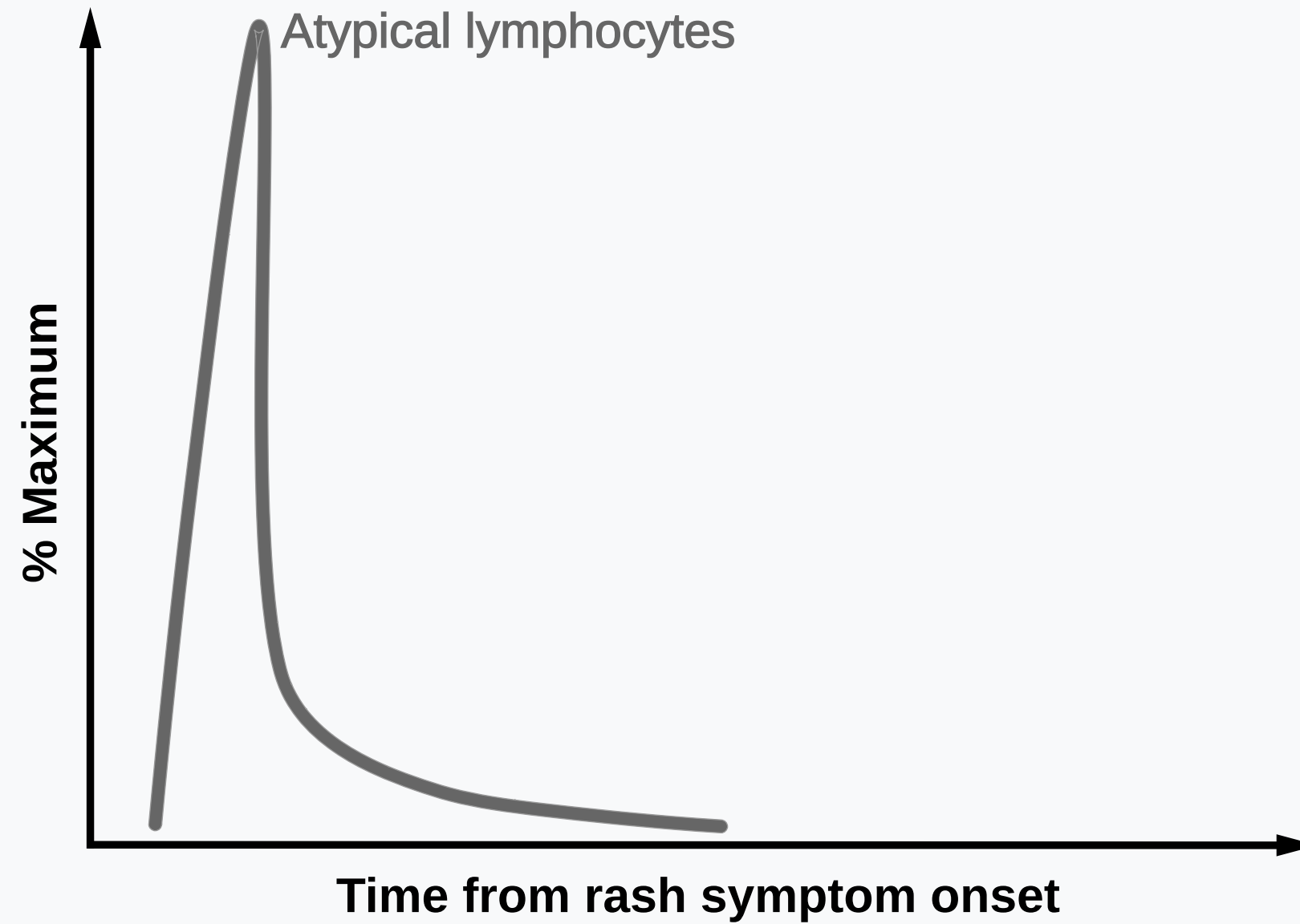
DRESS symptoms



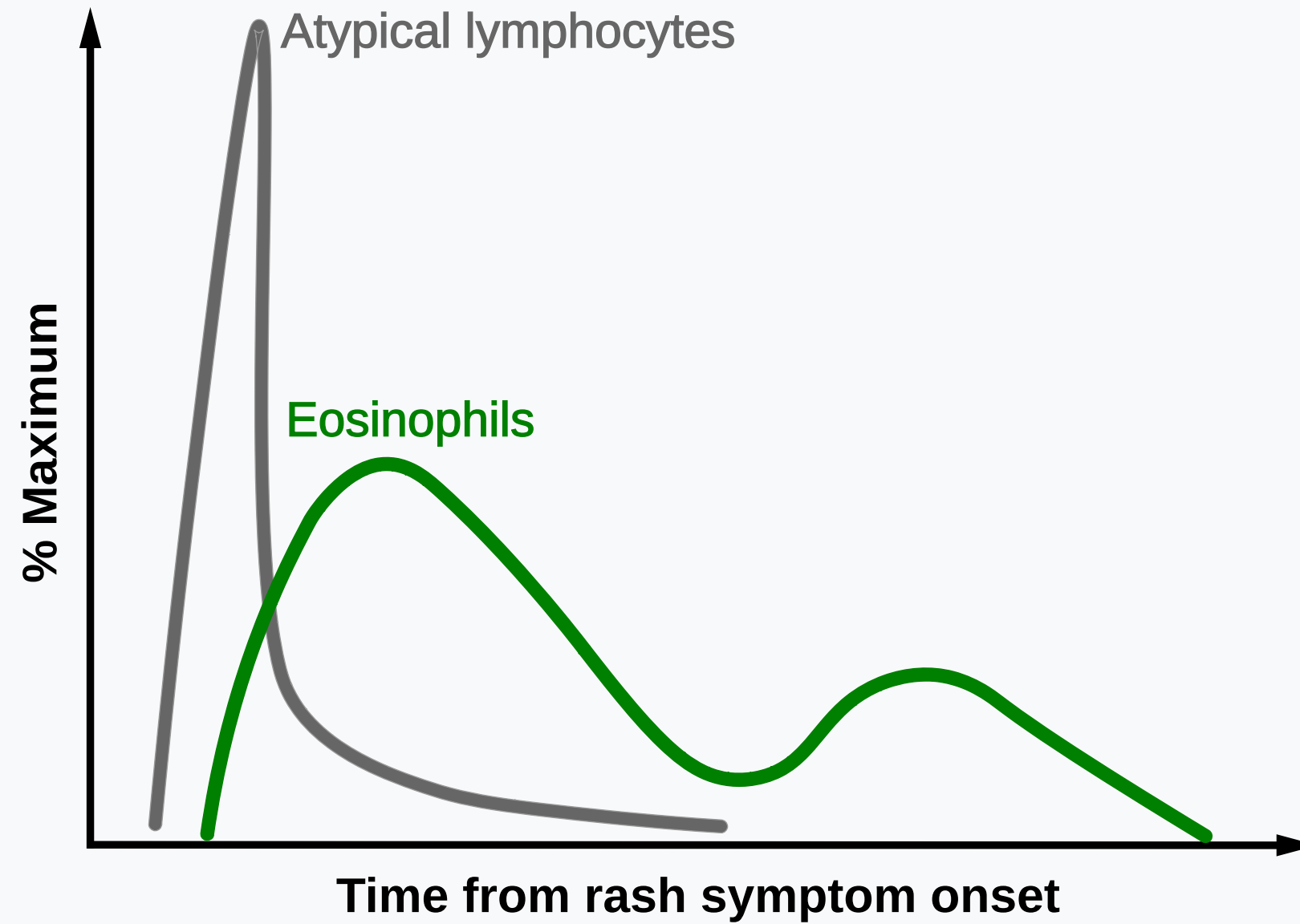
DRESS symptoms



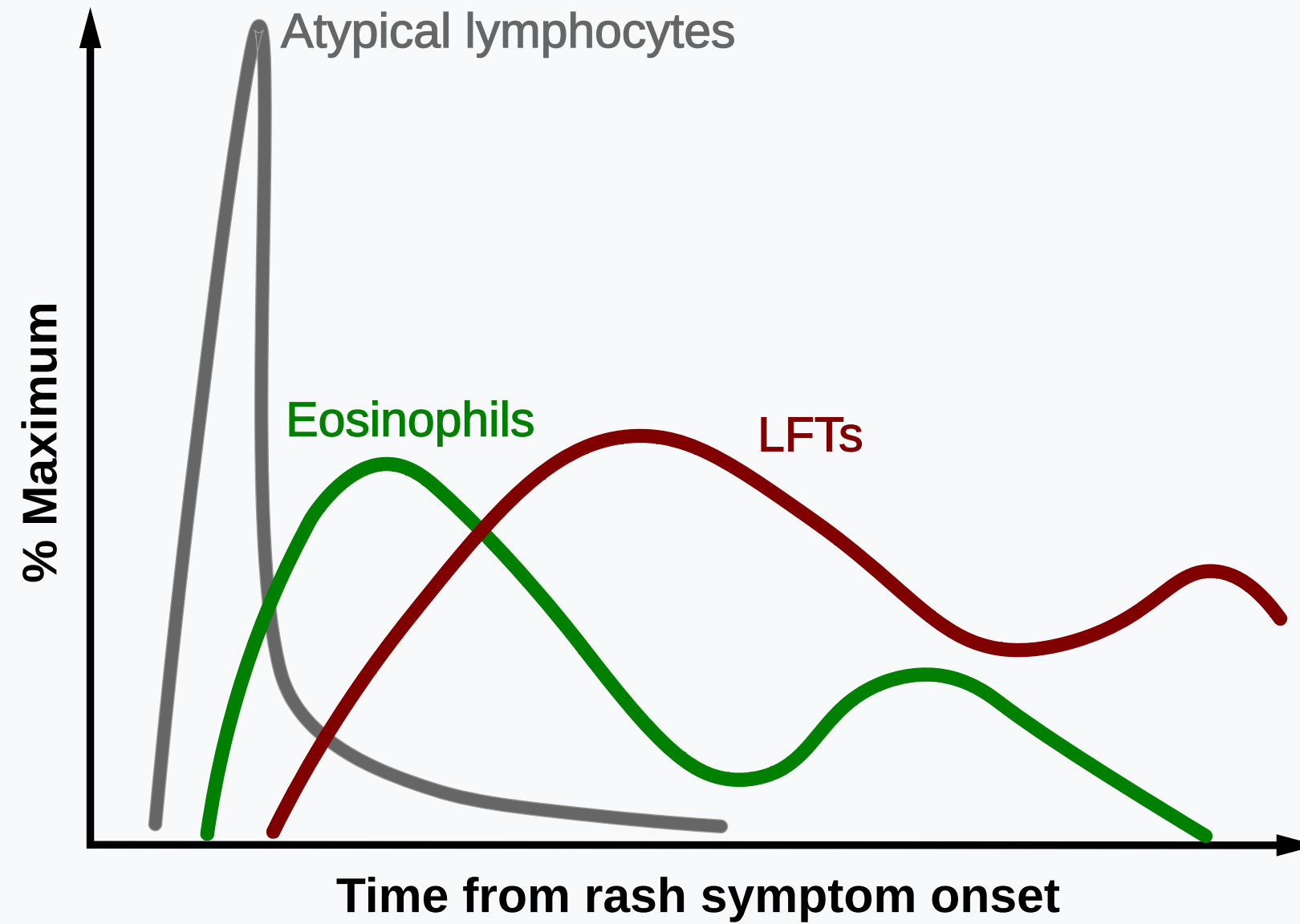
DRESS lab changes



DRESS lab changes



DRESS lab changes



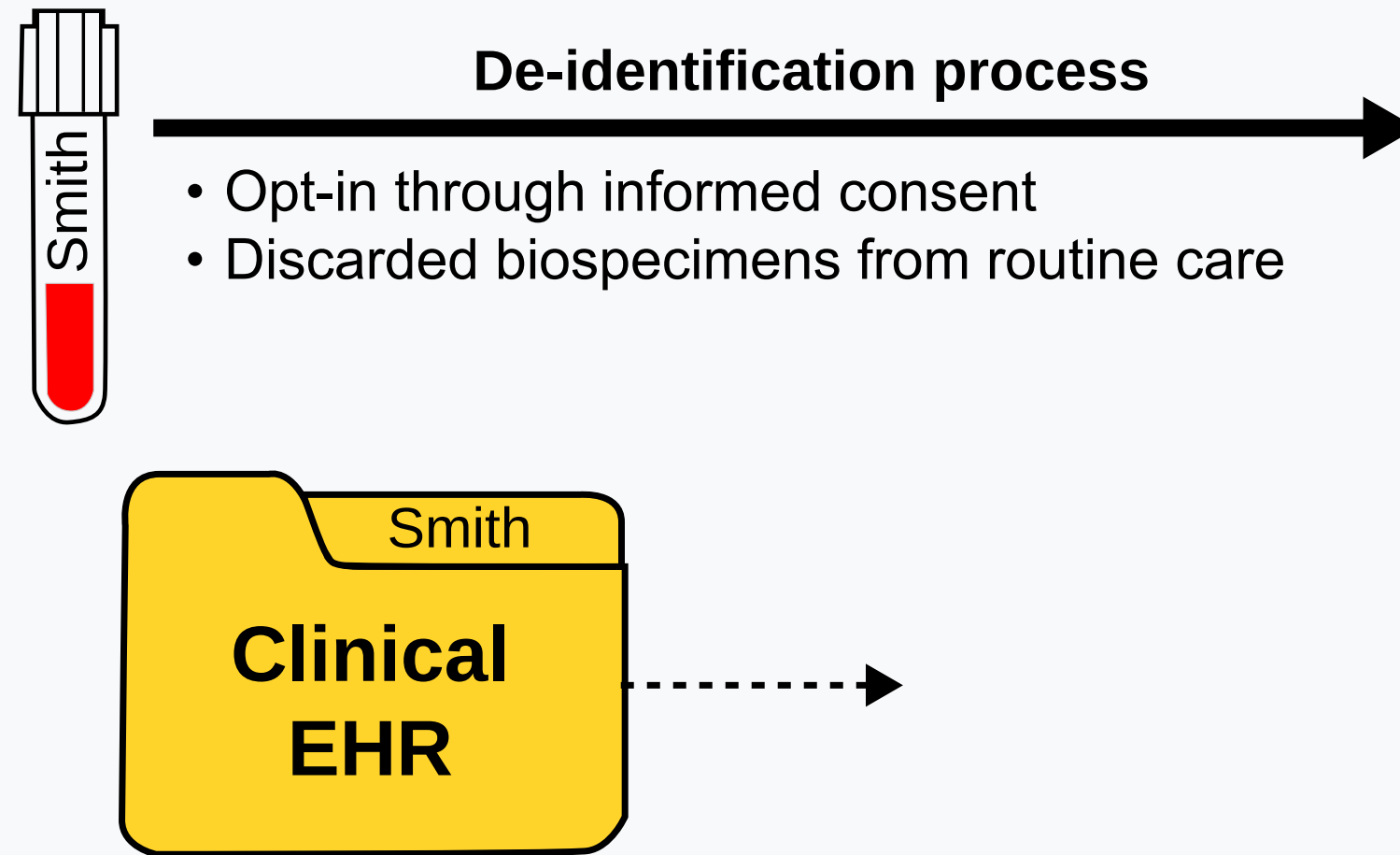
What is an EHR linked biobank?

**Clinical
biospecimens**



What is an EHR linked biobank?

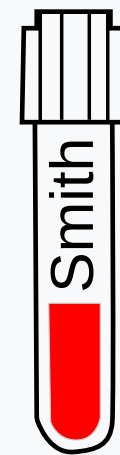
Clinical biospecimens



What is an EHR linked biobank?

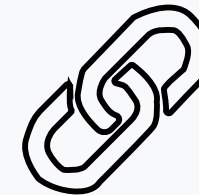
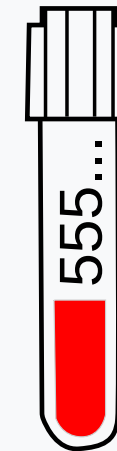
**Clinical
biospecimens**

Biobank



De-identification process

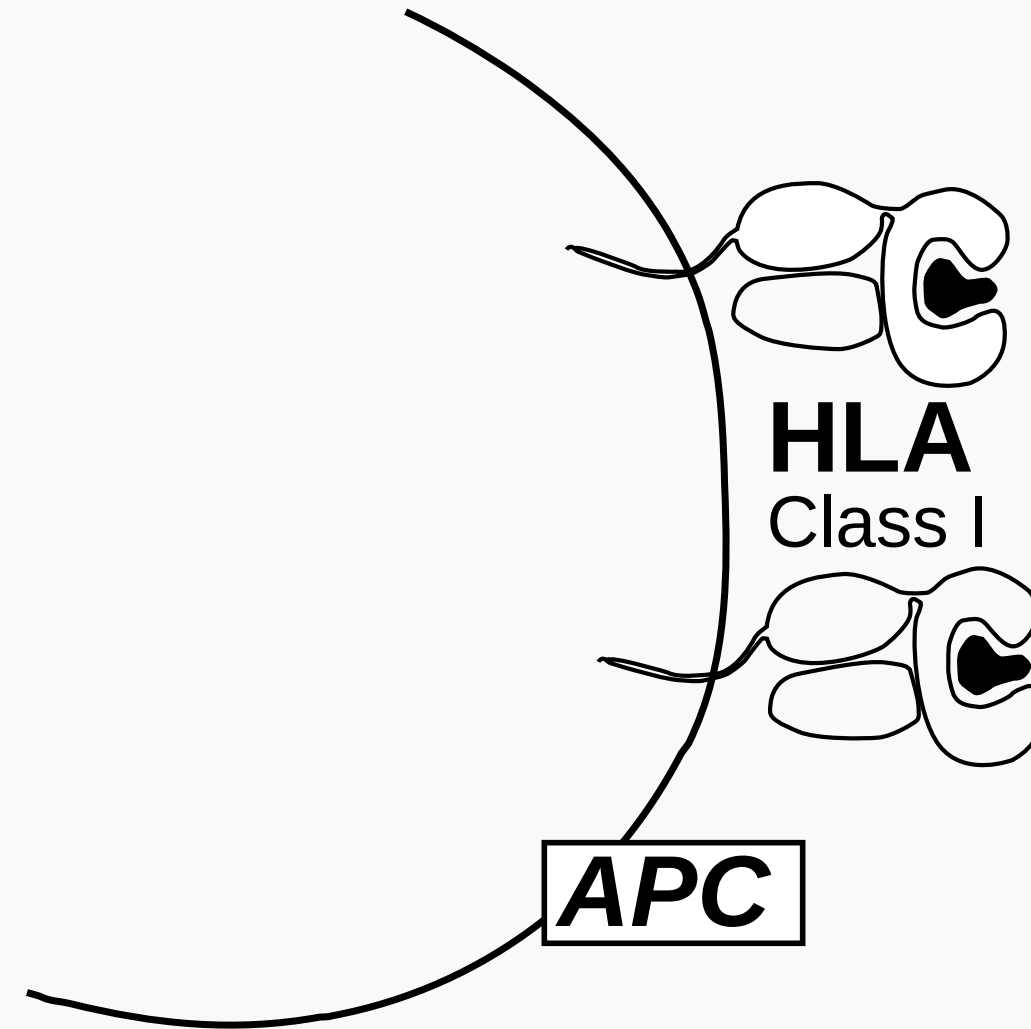
- Opt-in through informed consent
- Discarded biospecimens from routine care



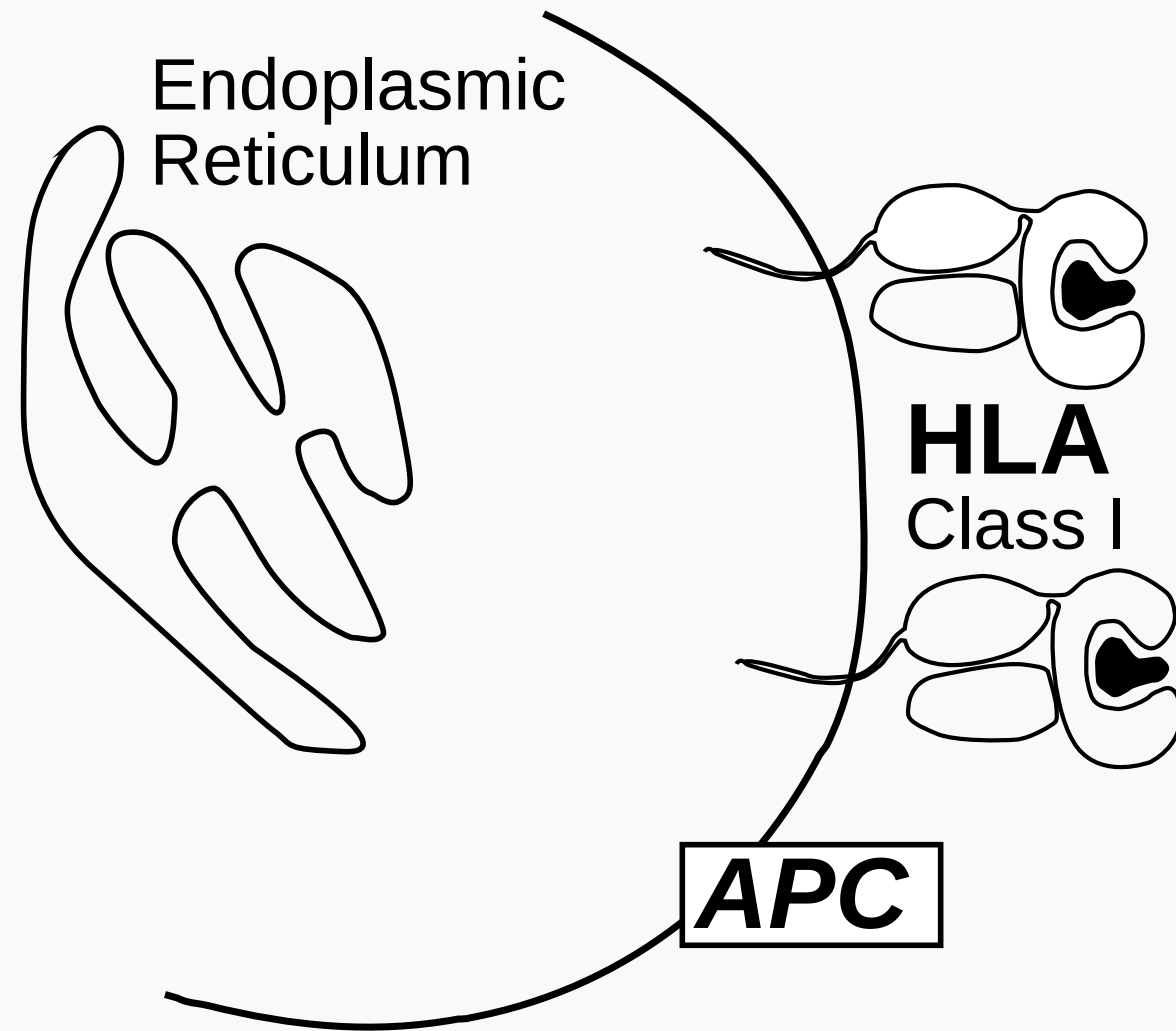
Skills that you can learn

Immunogenomics

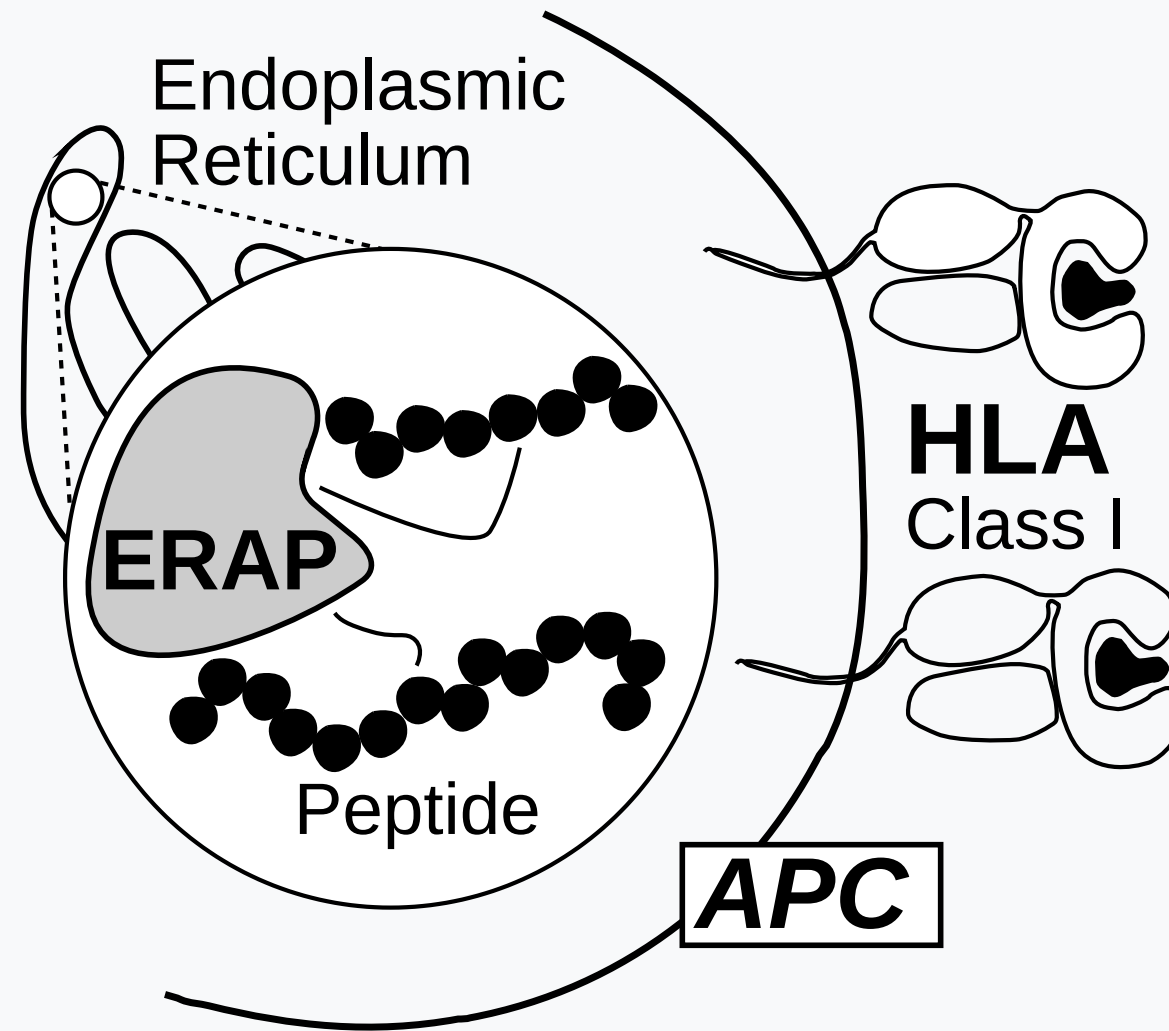
Immunogenomic interactions



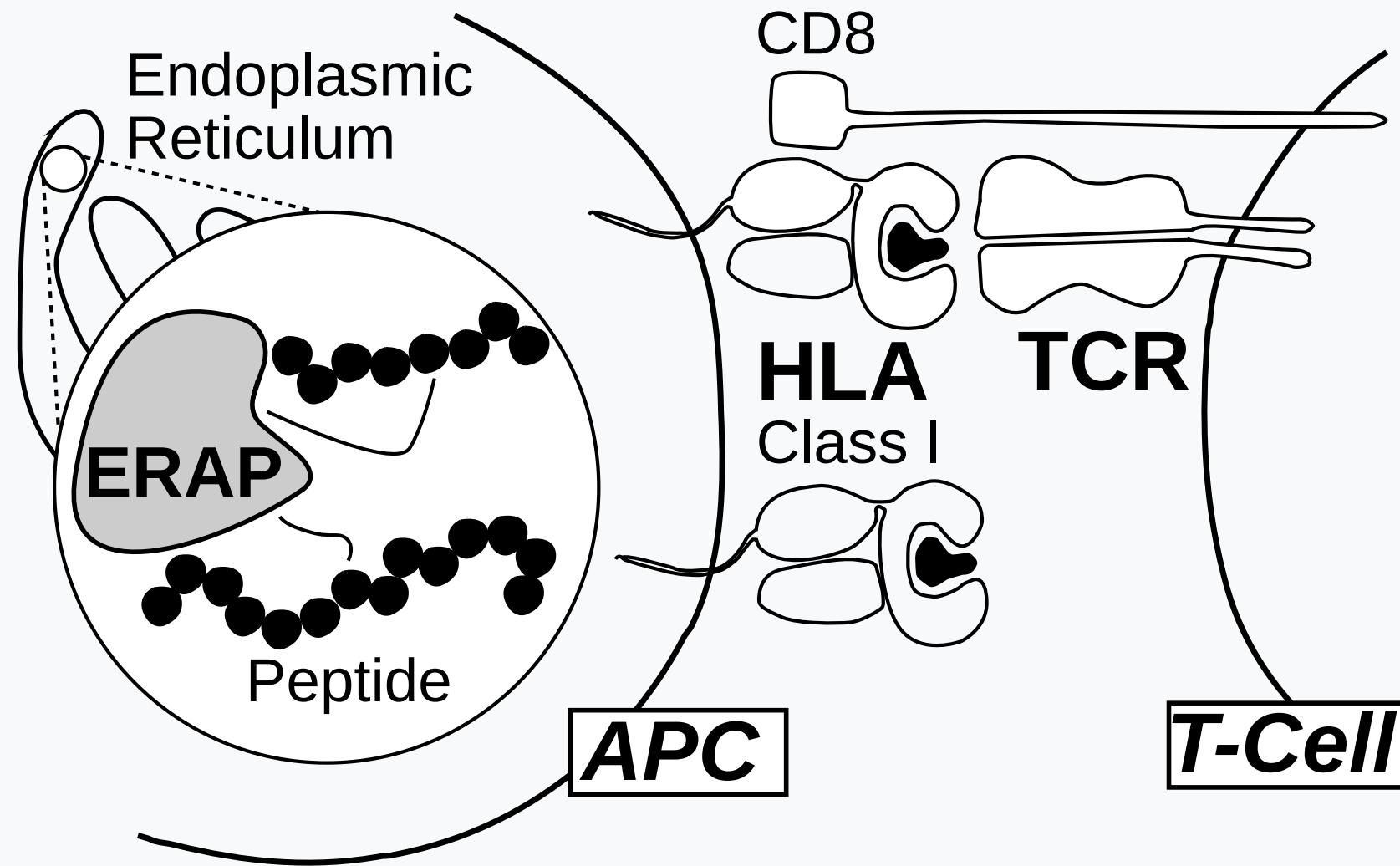
Immunogenomic interactions



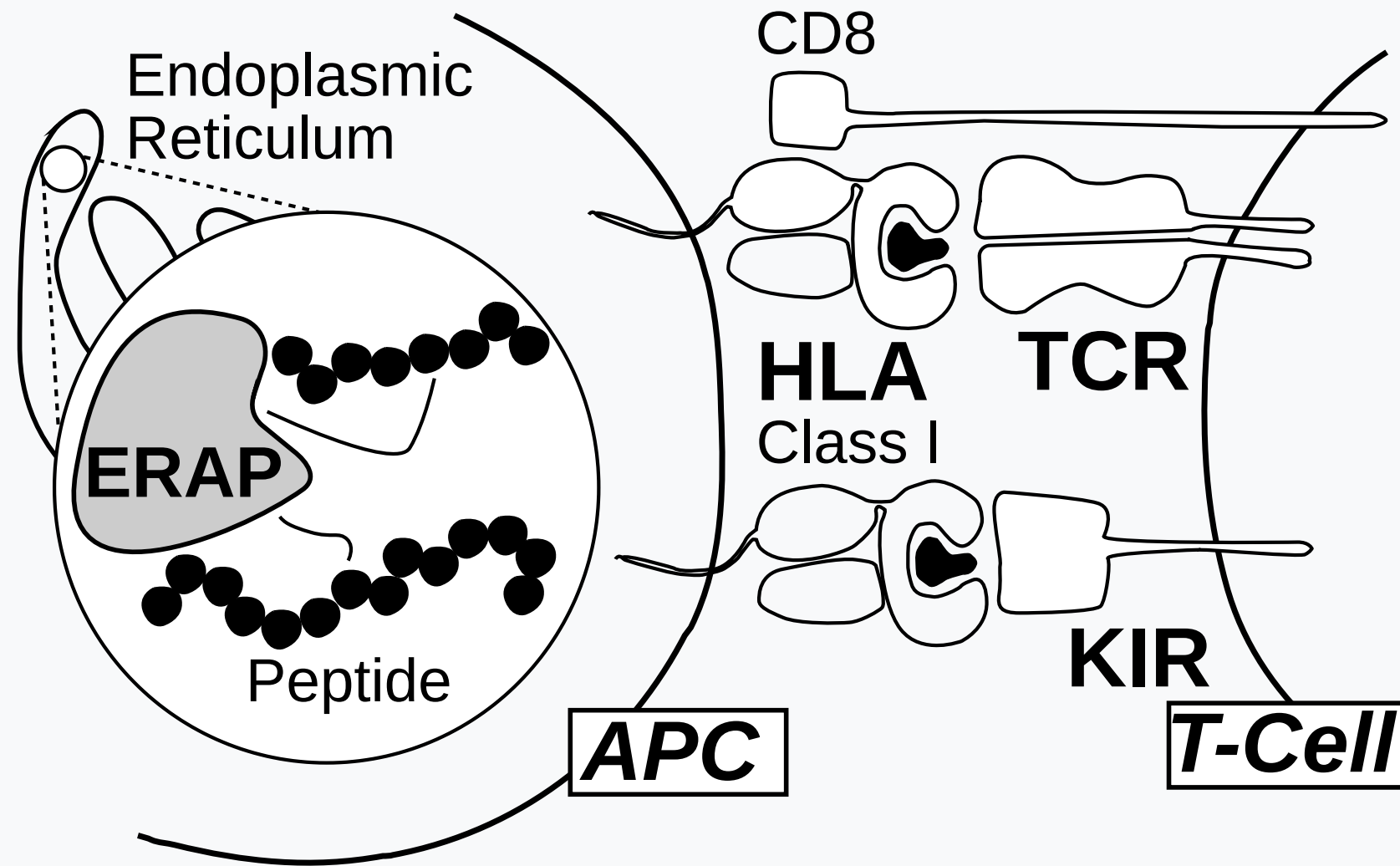
Immunogenomic interactions



Immunogenomic interactions



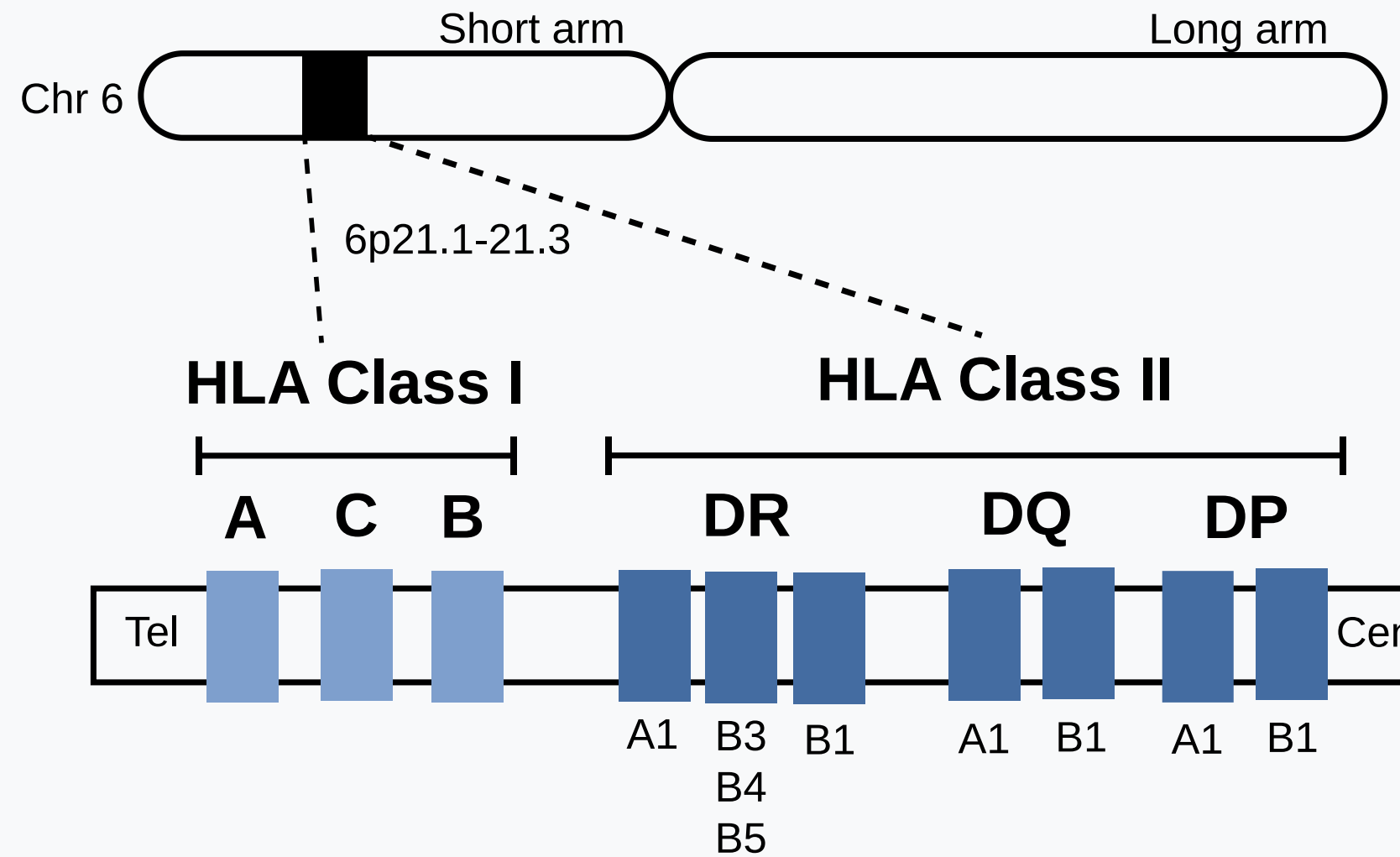
Immunogenomic interactions



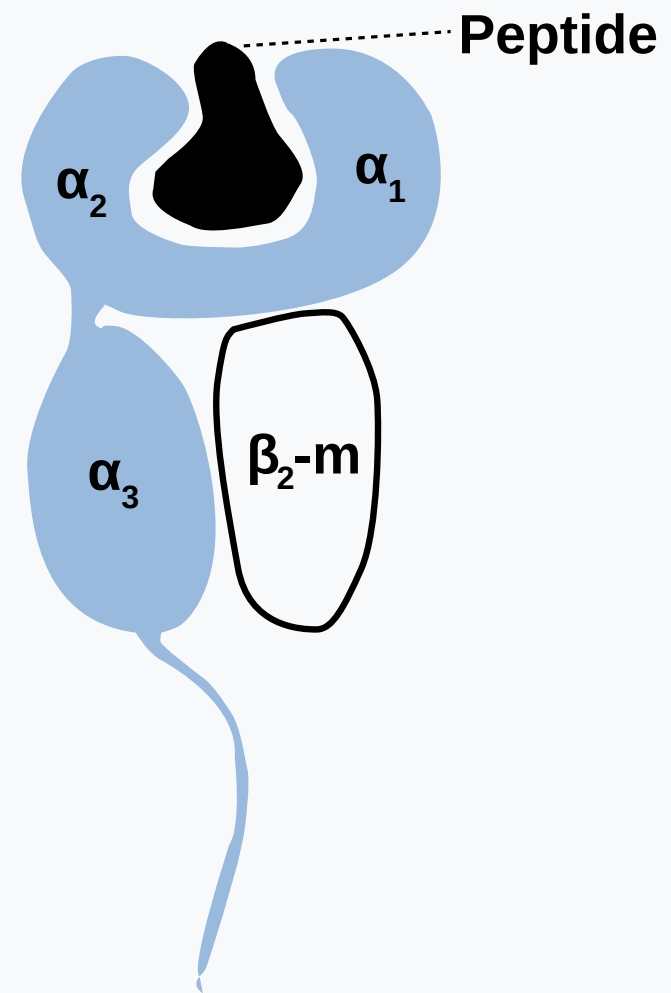
HLA



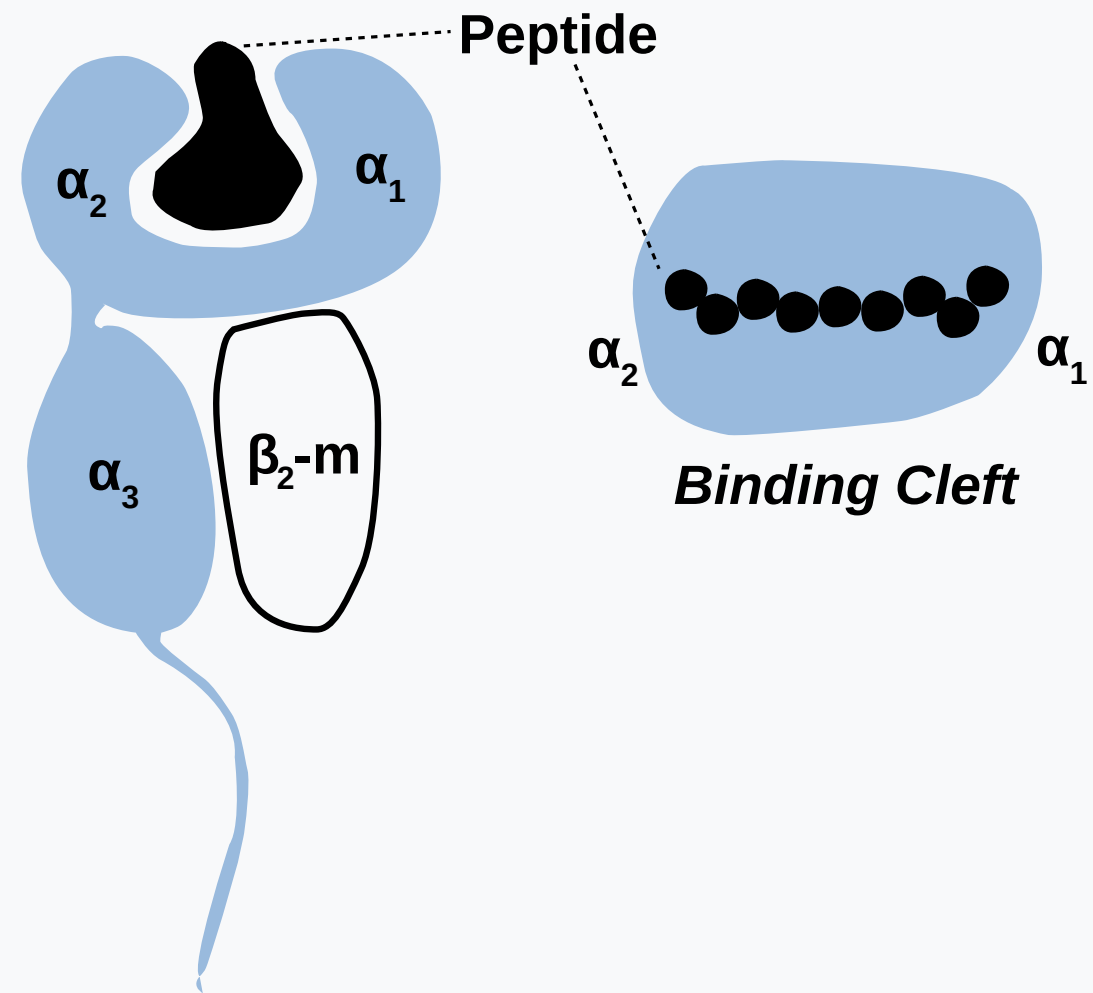
HLA



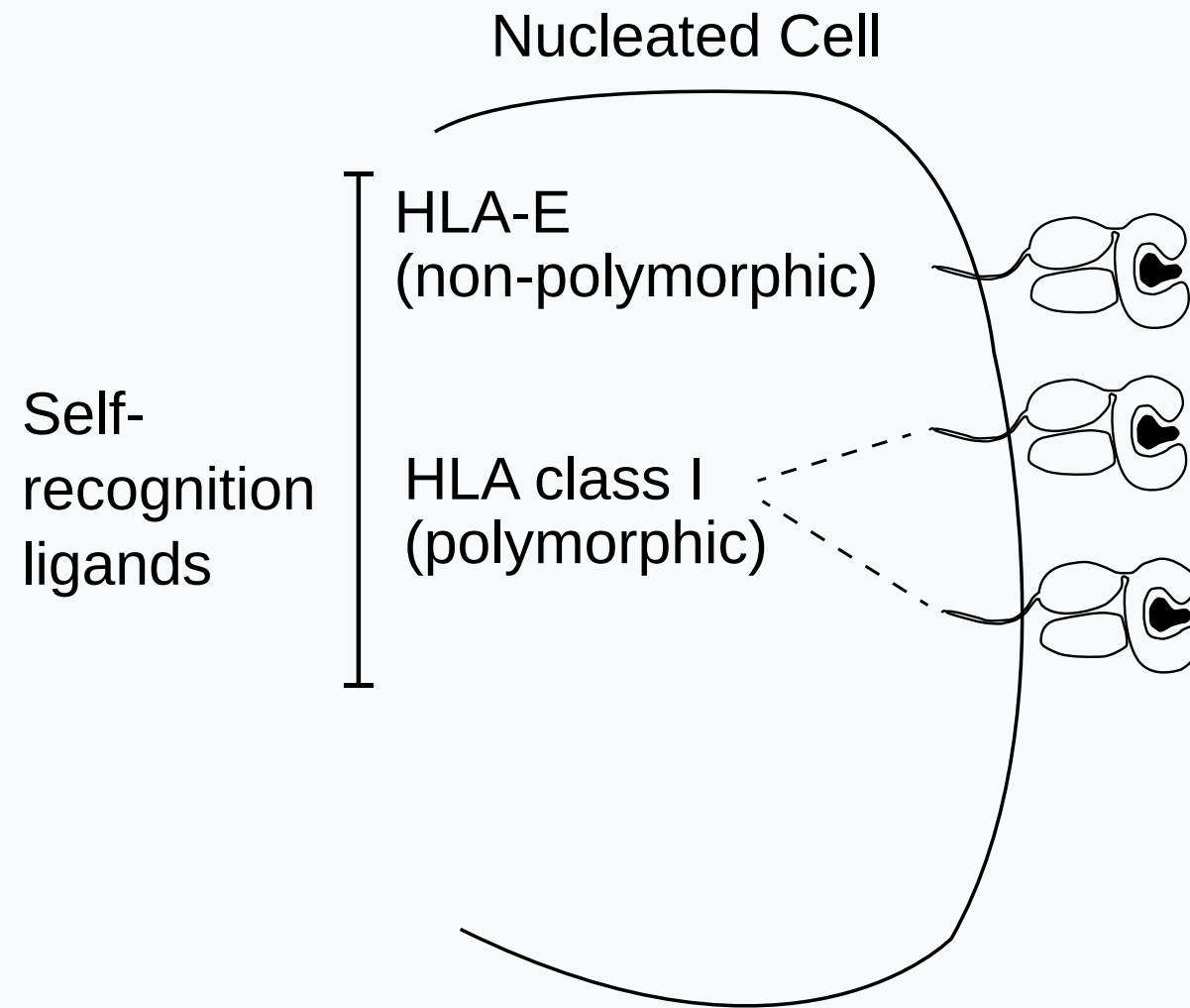
HLA Class I



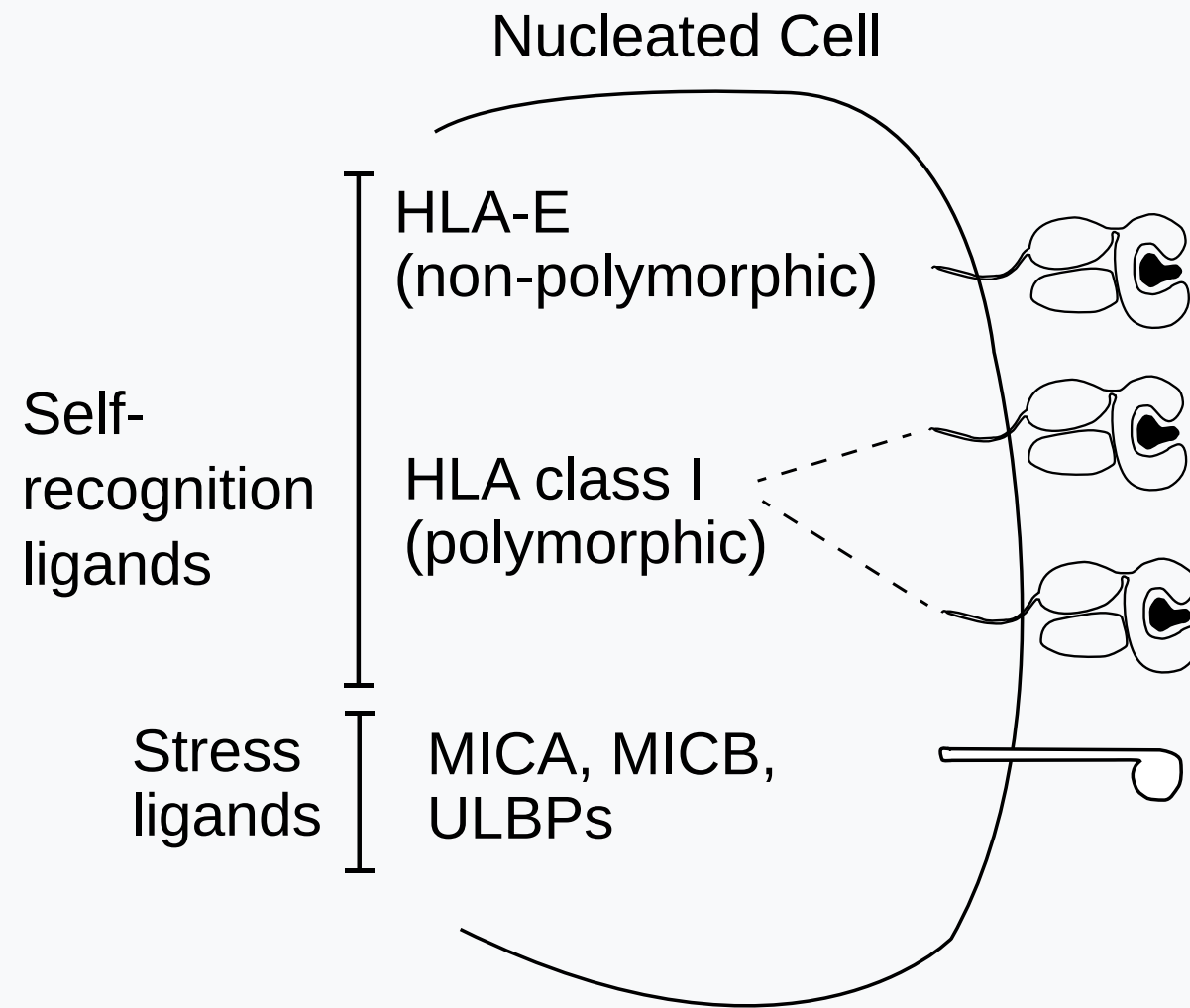
HLA Class I



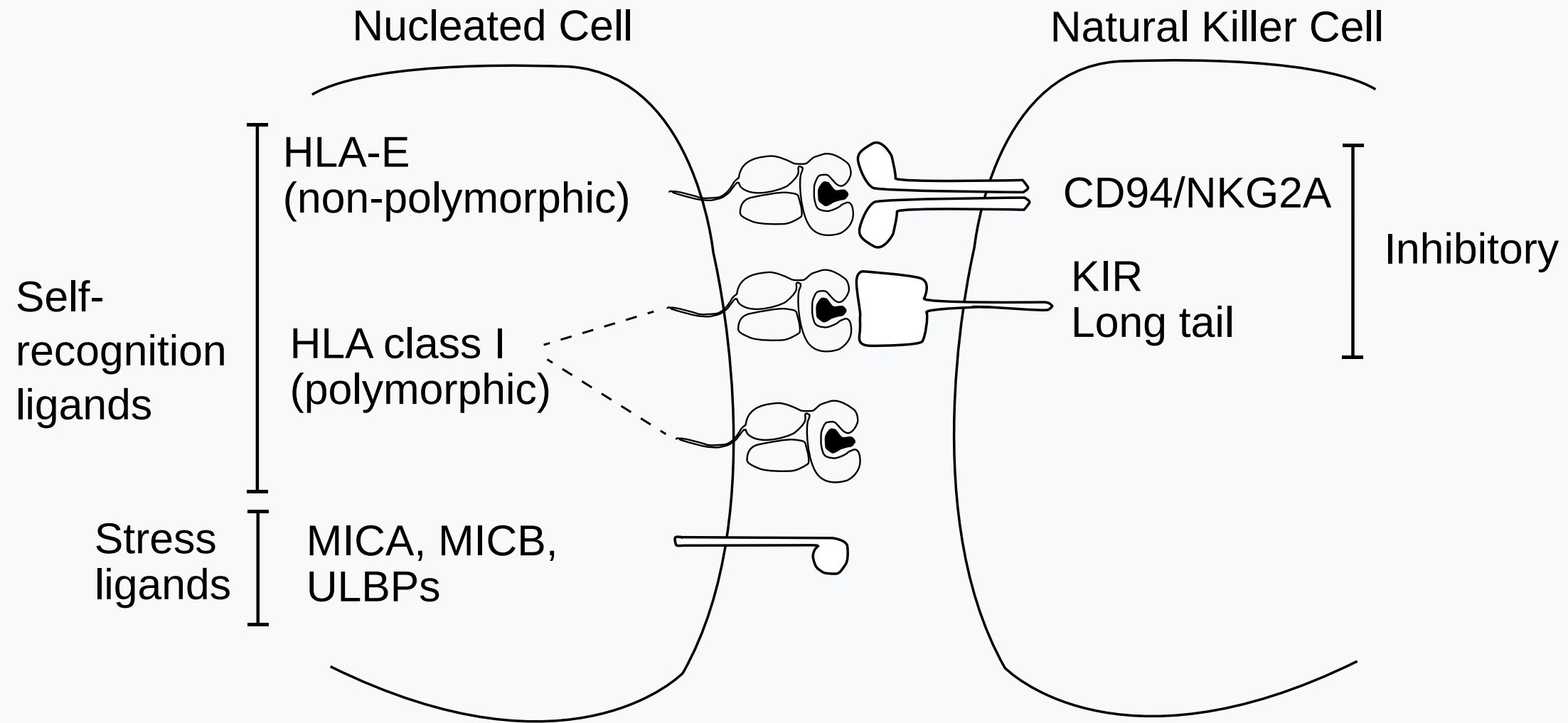
Killer-cell immunoglobulin like receptors (KIR)



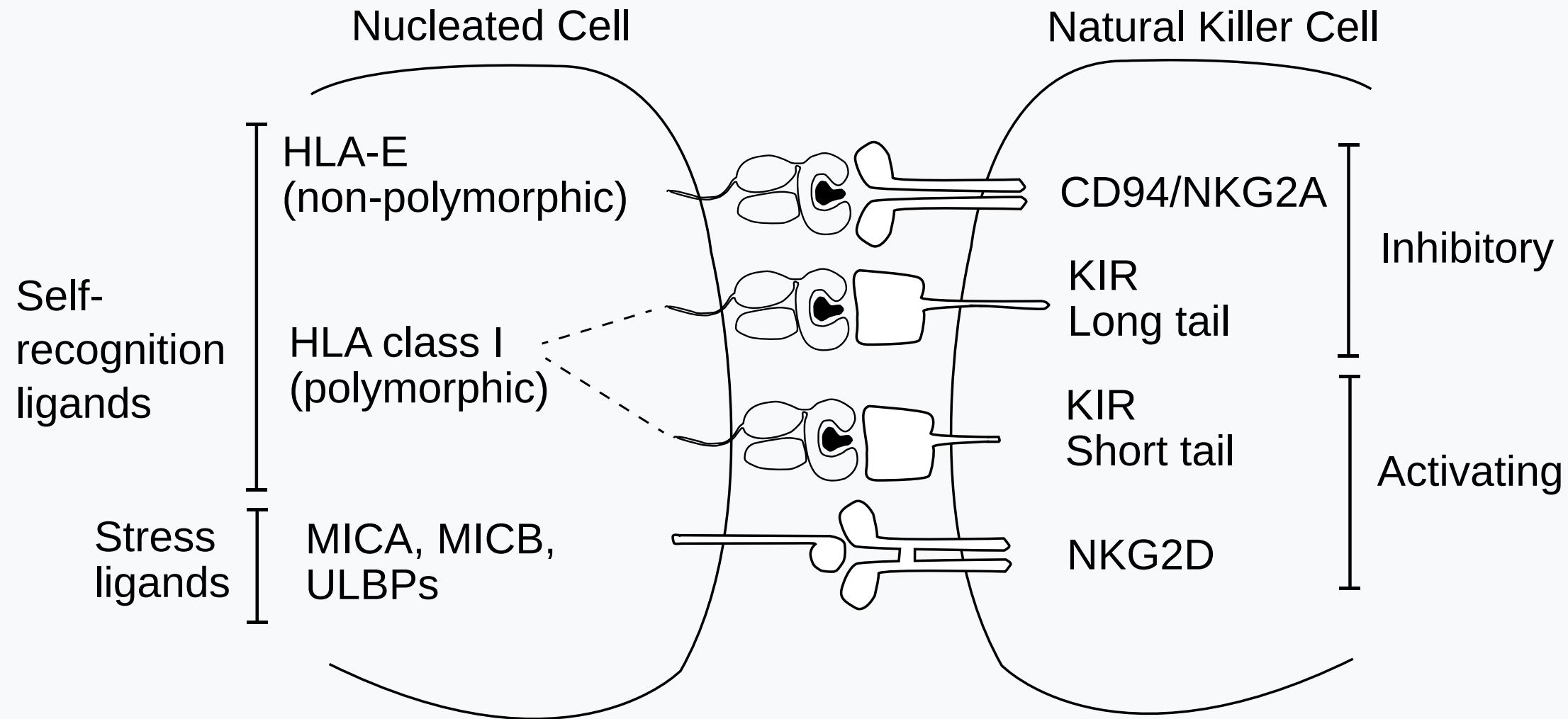
Killer-cell immunoglobulin like receptors (KIR)



Killer-cell immunoglobulin like receptors (KIR)

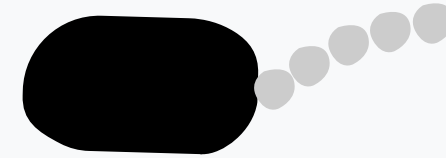


Killer-cell immunoglobulin like receptors (KIR)

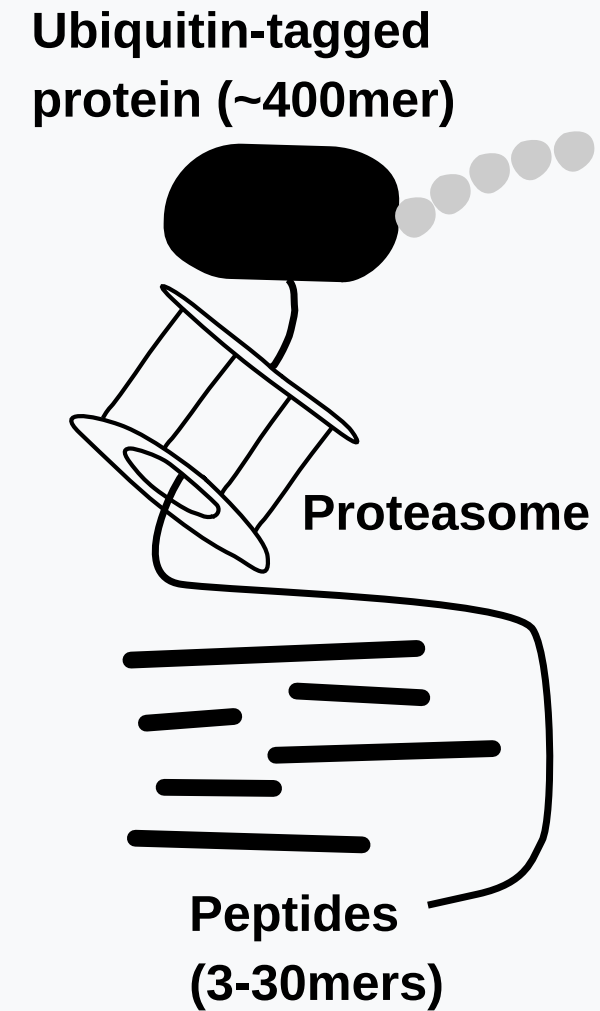


Endoplasmic reticulum aminopeptidases

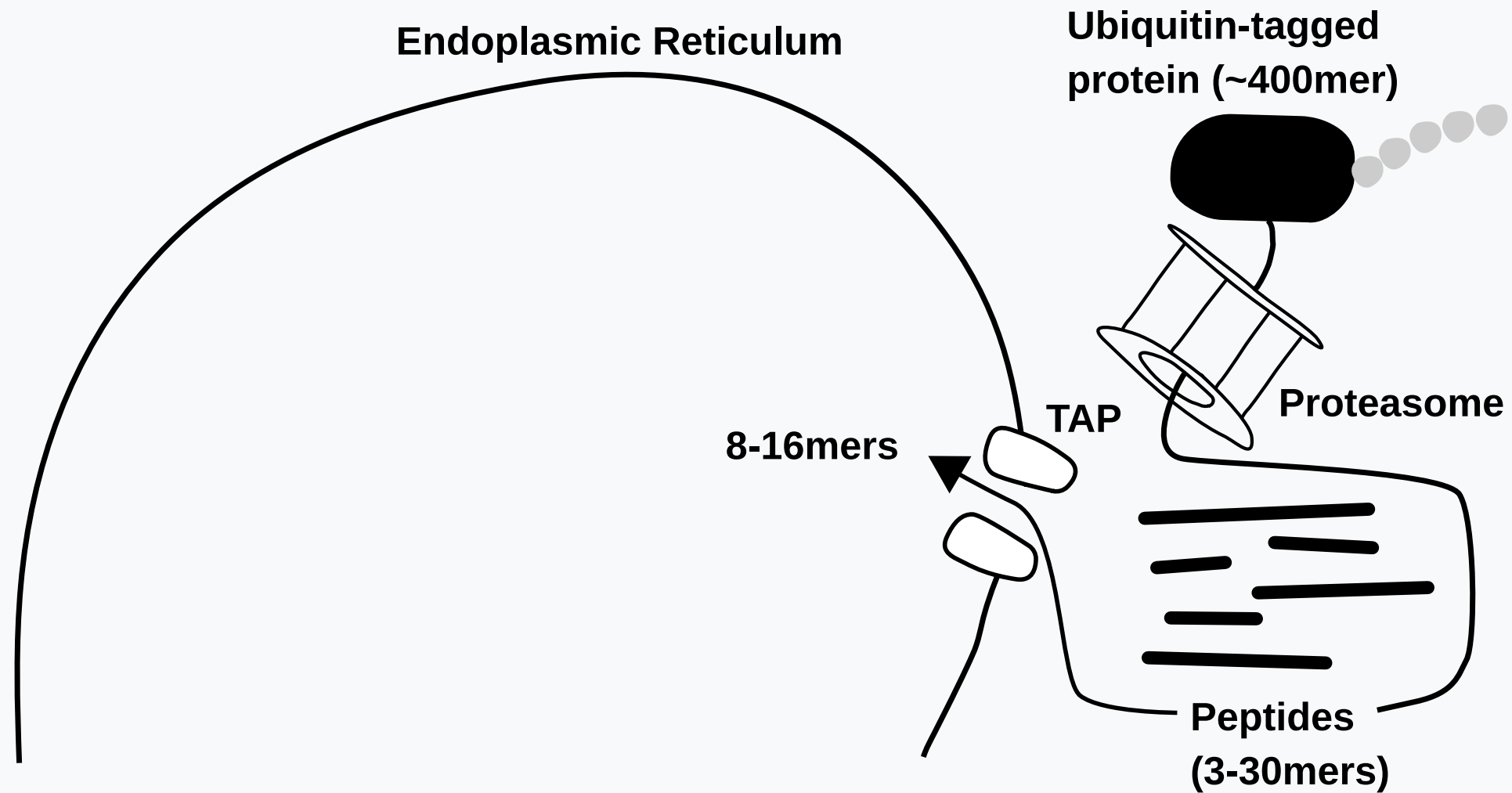
Ubiquitin-tagged
protein (~400mer)



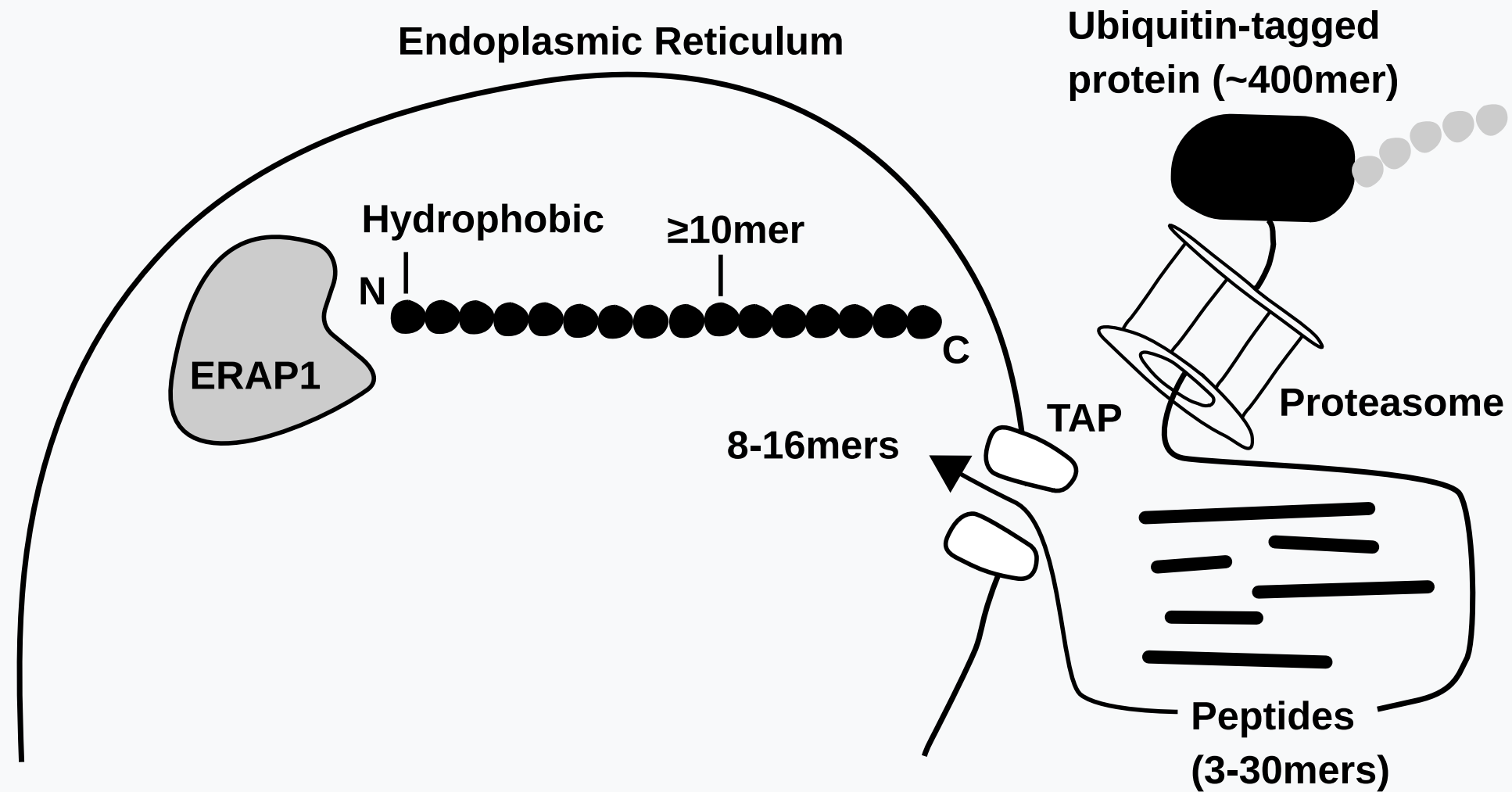
Endoplasmic reticulum aminopeptidases



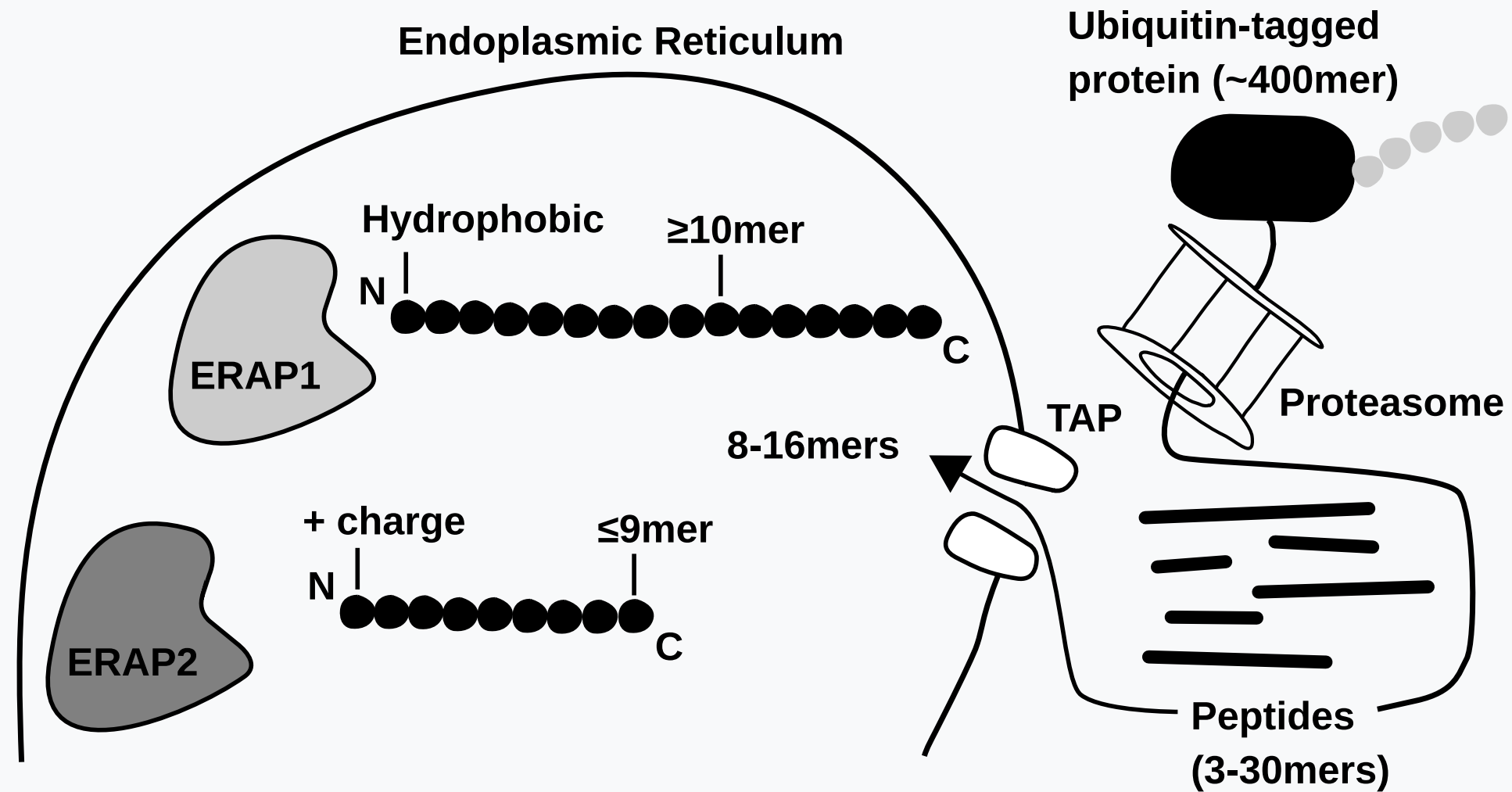
Endoplasmic reticulum aminopeptidases



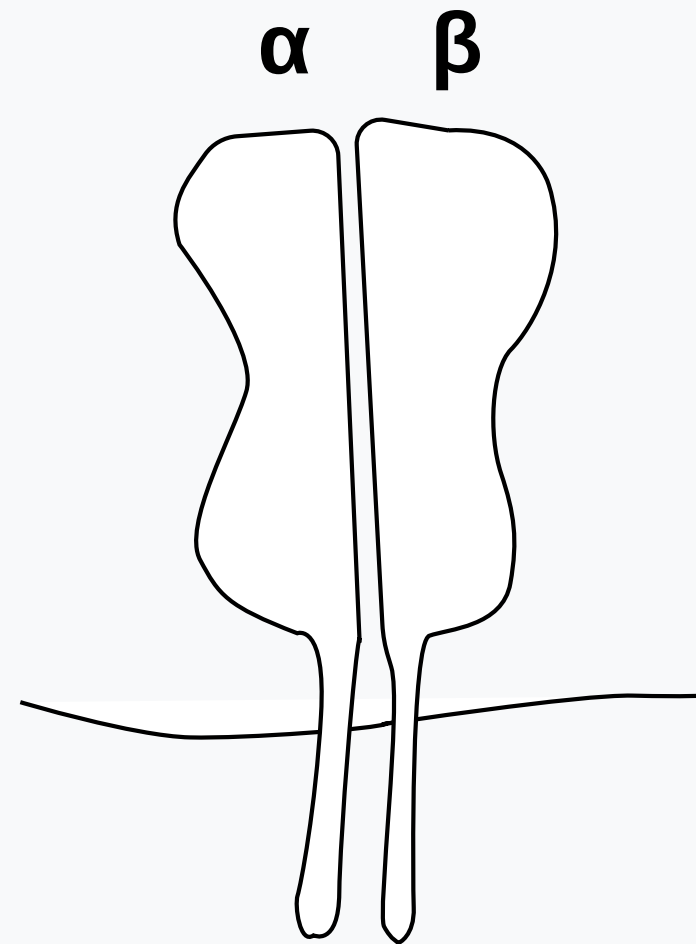
Endoplasmic reticulum aminopeptidases



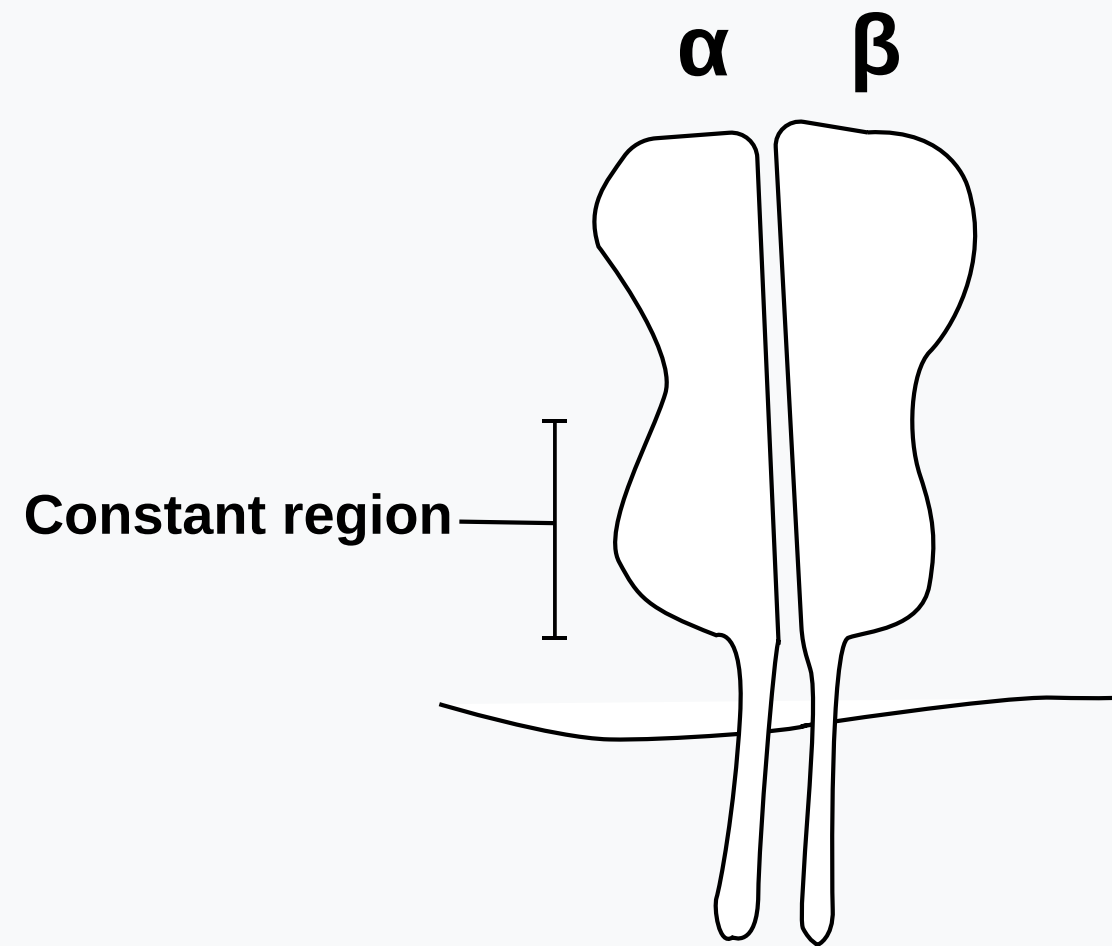
Endoplasmic reticulum aminopeptidases



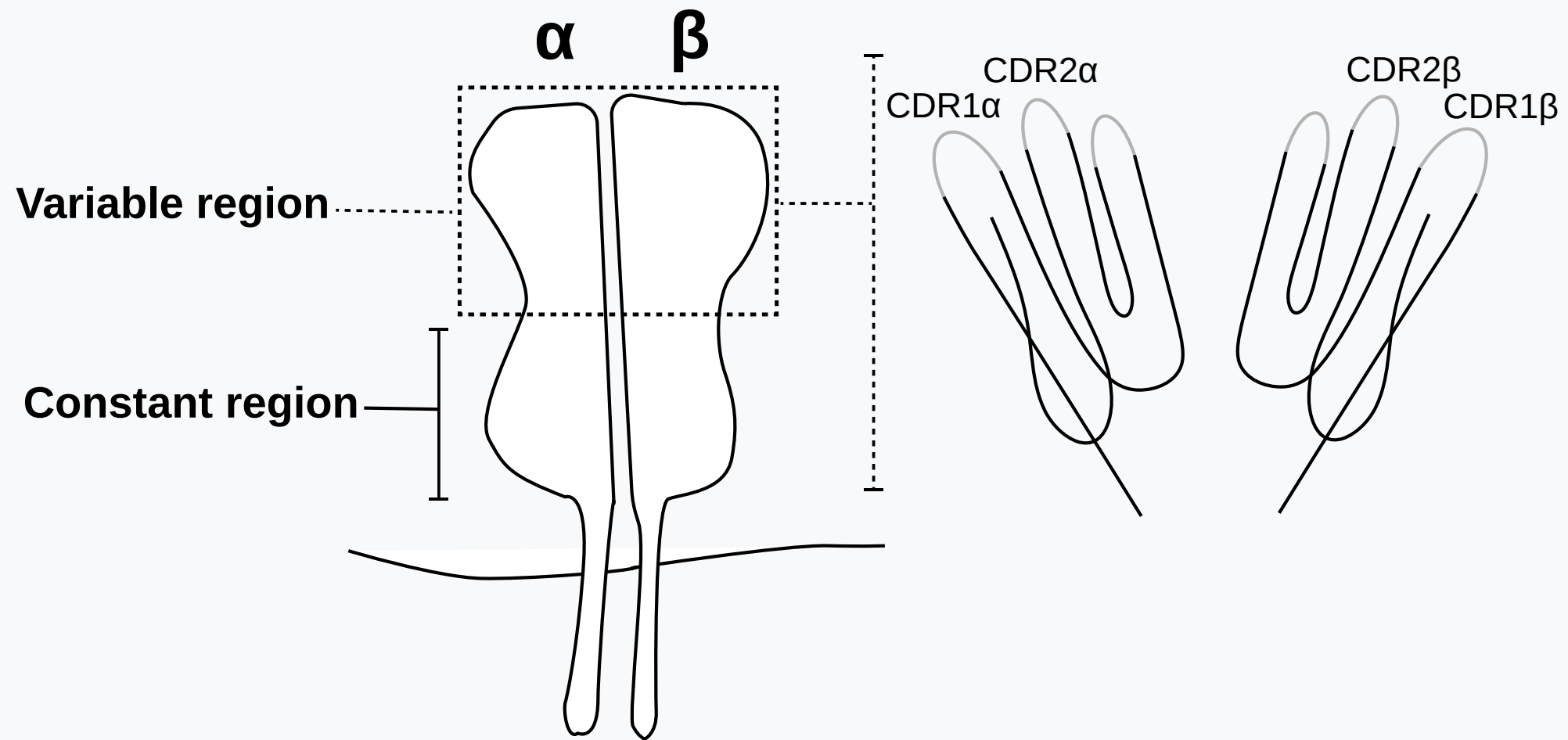
T-cell receptors



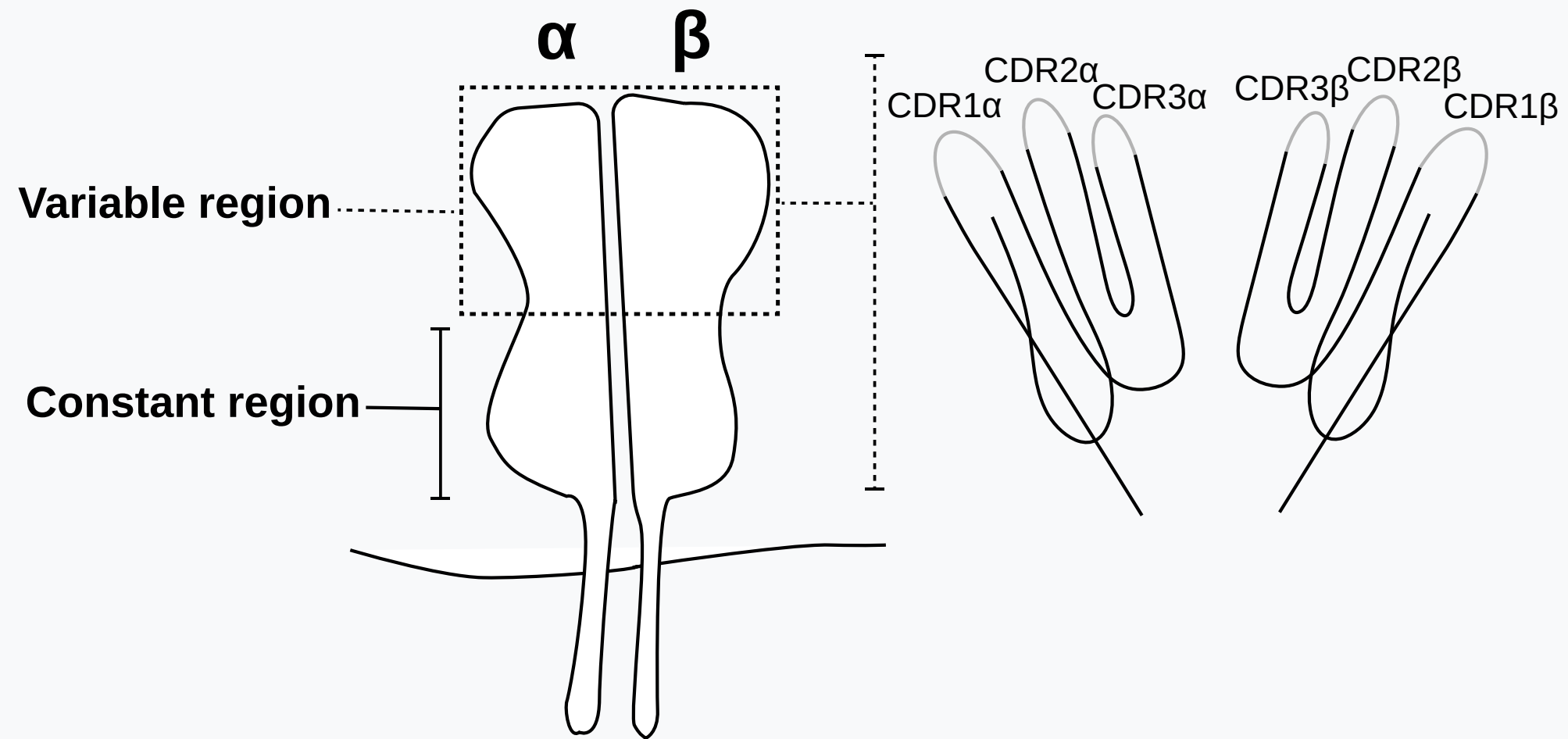
T-cell receptors



T-cell receptors



T-cell receptors



Phenotyping in electronic health records

Data structure in EHR

Structured

ID	Lab	Value
555	Abs Eos	0.5
555	ALT	200

Tables

Data structure in EHR

Structured

ID	Lab	Value
555	Abs Eos	0.5
555	ALT	200

Tables

Semi-structured

Allergy List Vancomycin (DRESS)

Organized lists

Data structure in EHR

Structured

ID	Lab	Value
555	Abs Eos	0.5
555	ALT	200

Tables

Semi-structured

Allergy List Vancomycin (DRESS)

Organized lists

Unstructured

"[Name] is a 40 year old male with a history of DRESS

Narrative texts

Data structure in EHR

Structured

ID	Lab	Value
555	Abs Eos	0.5
555	ALT	200

Tables

Semi-structured

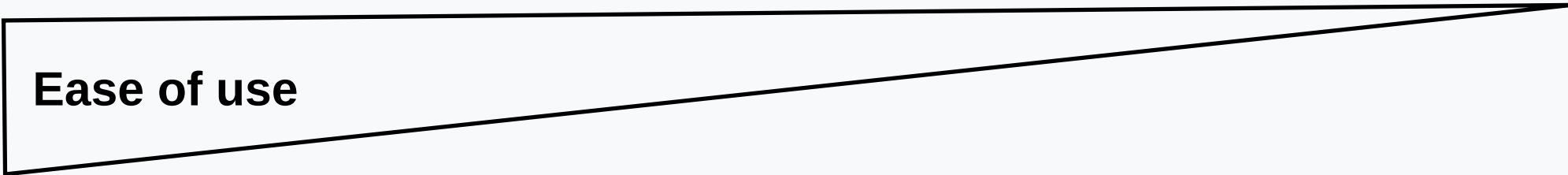
Allergy List Vancomycin (DRESS)

Organized lists

Unstructured

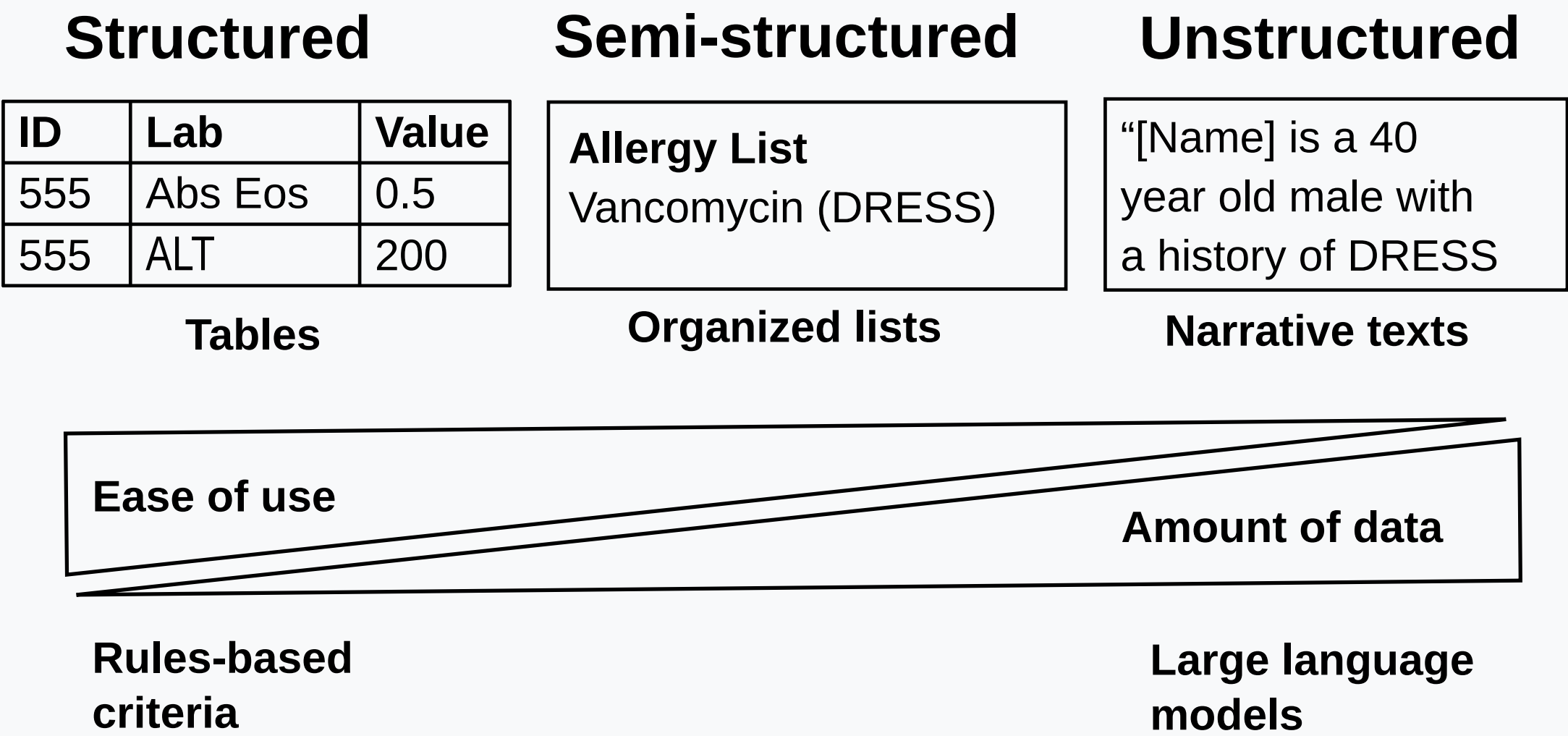
“[Name] is a 40 year old male with a history of DRESS

Narrative texts



Rules-based
criteria

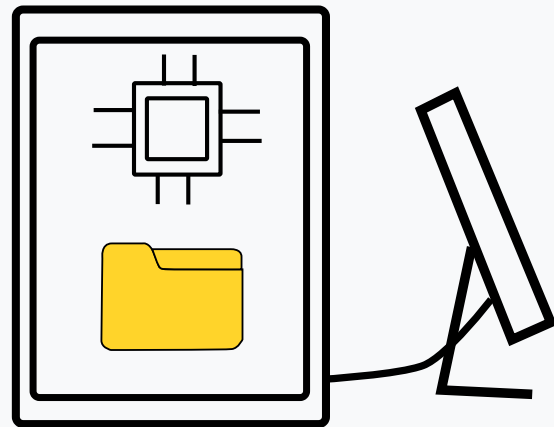
Data structure in EHR



Bioinformatic data analysis

Computing in the cloud

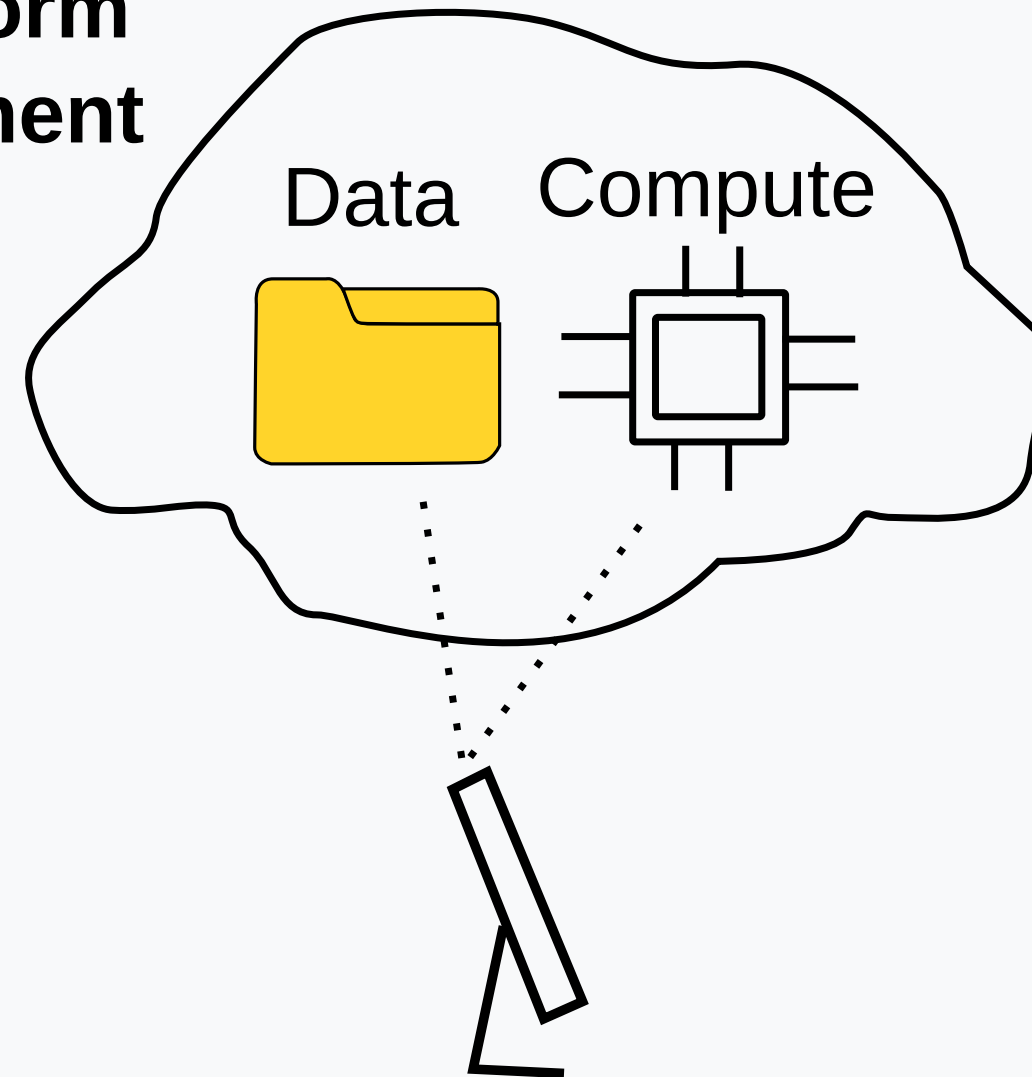
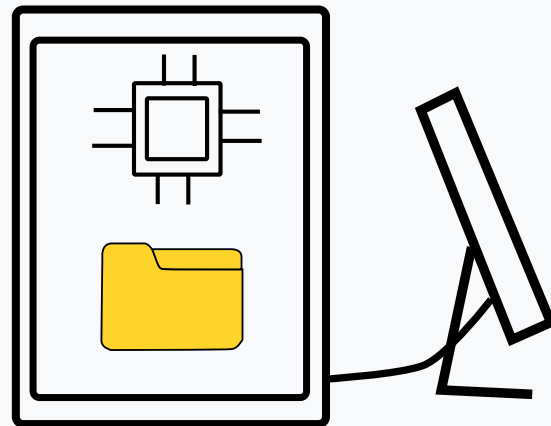
Traditional bioinformatics



Computing in the cloud

**Research platform
cloud environment**

**Traditional
bioinformatics**

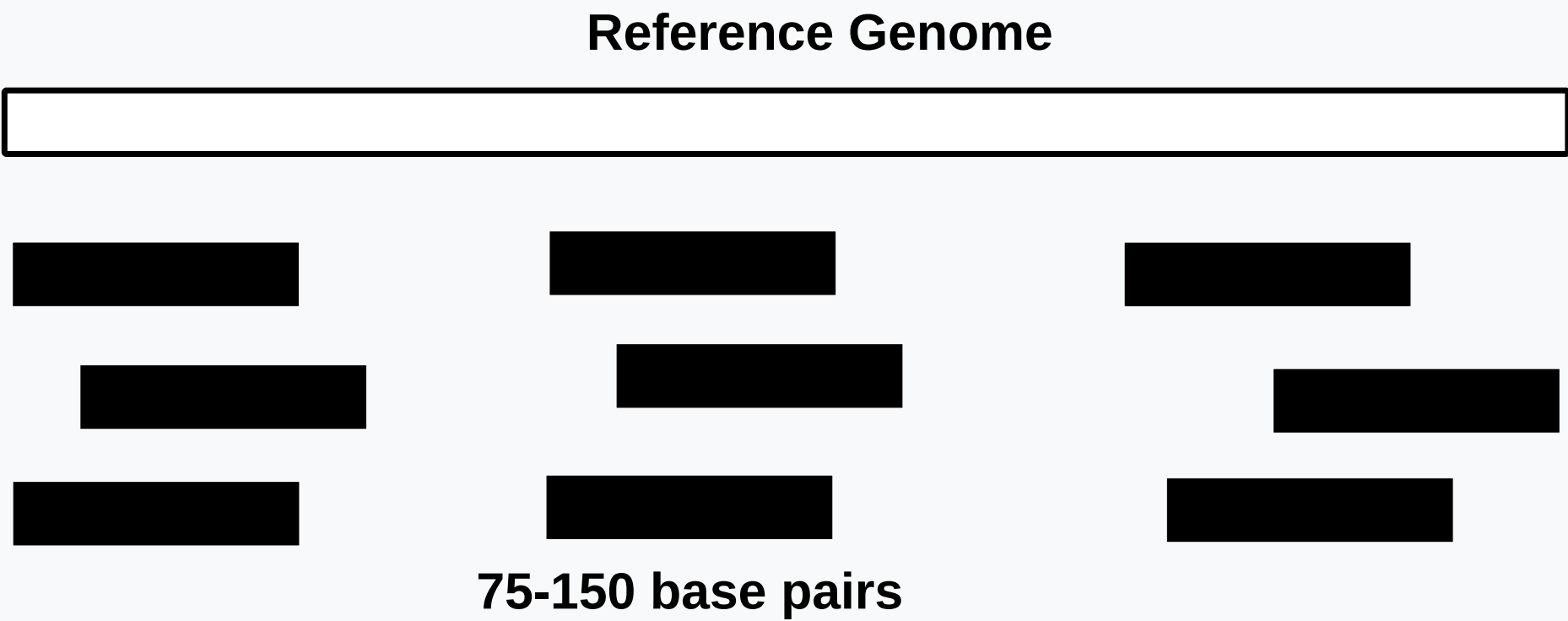


Short read whole genome sequencing

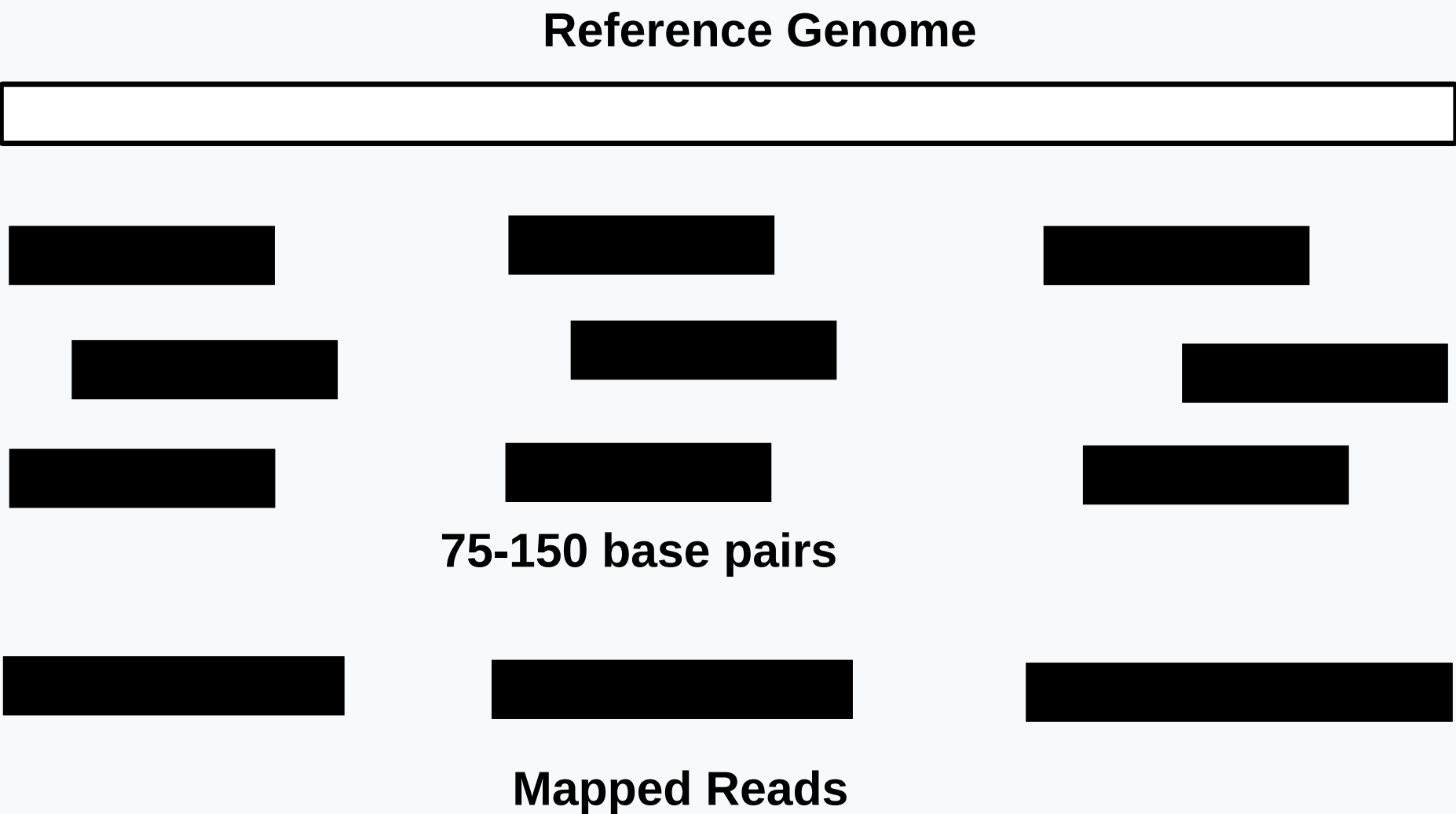
Reference Genome



Short read whole genome sequencing



Short read whole genome sequencing

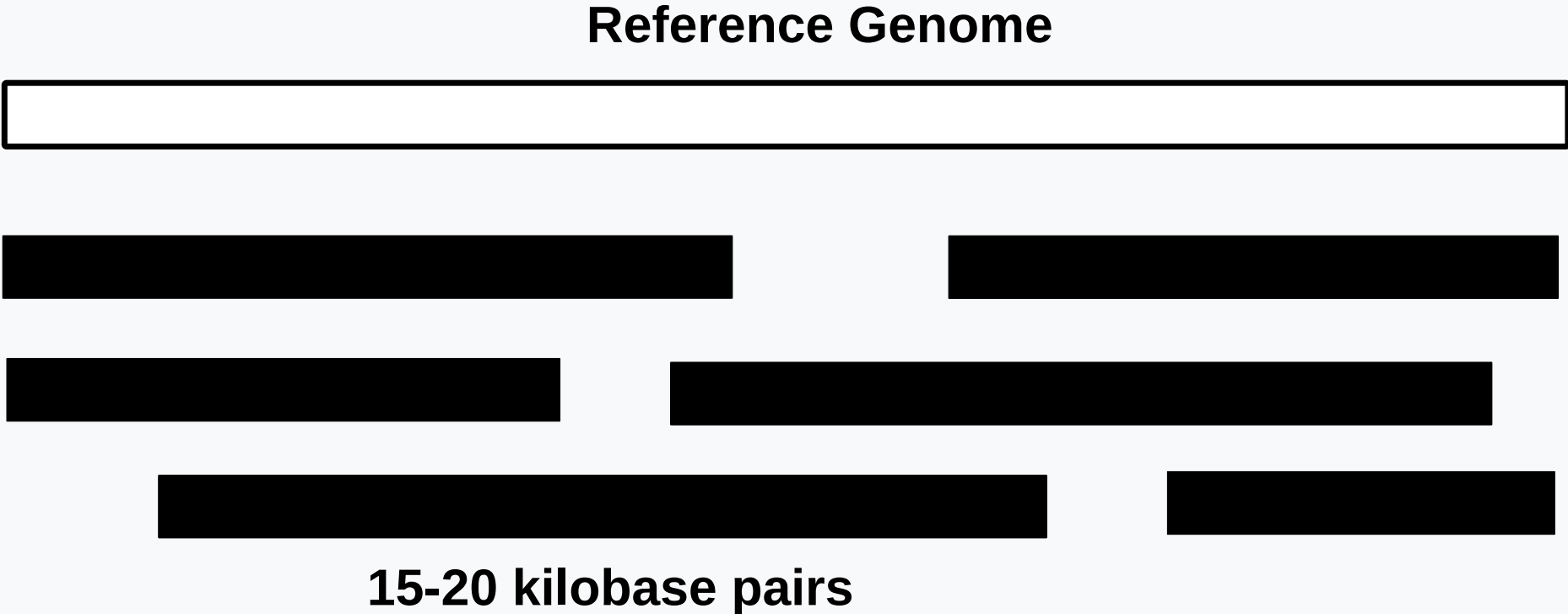


Long read whole genome sequencing

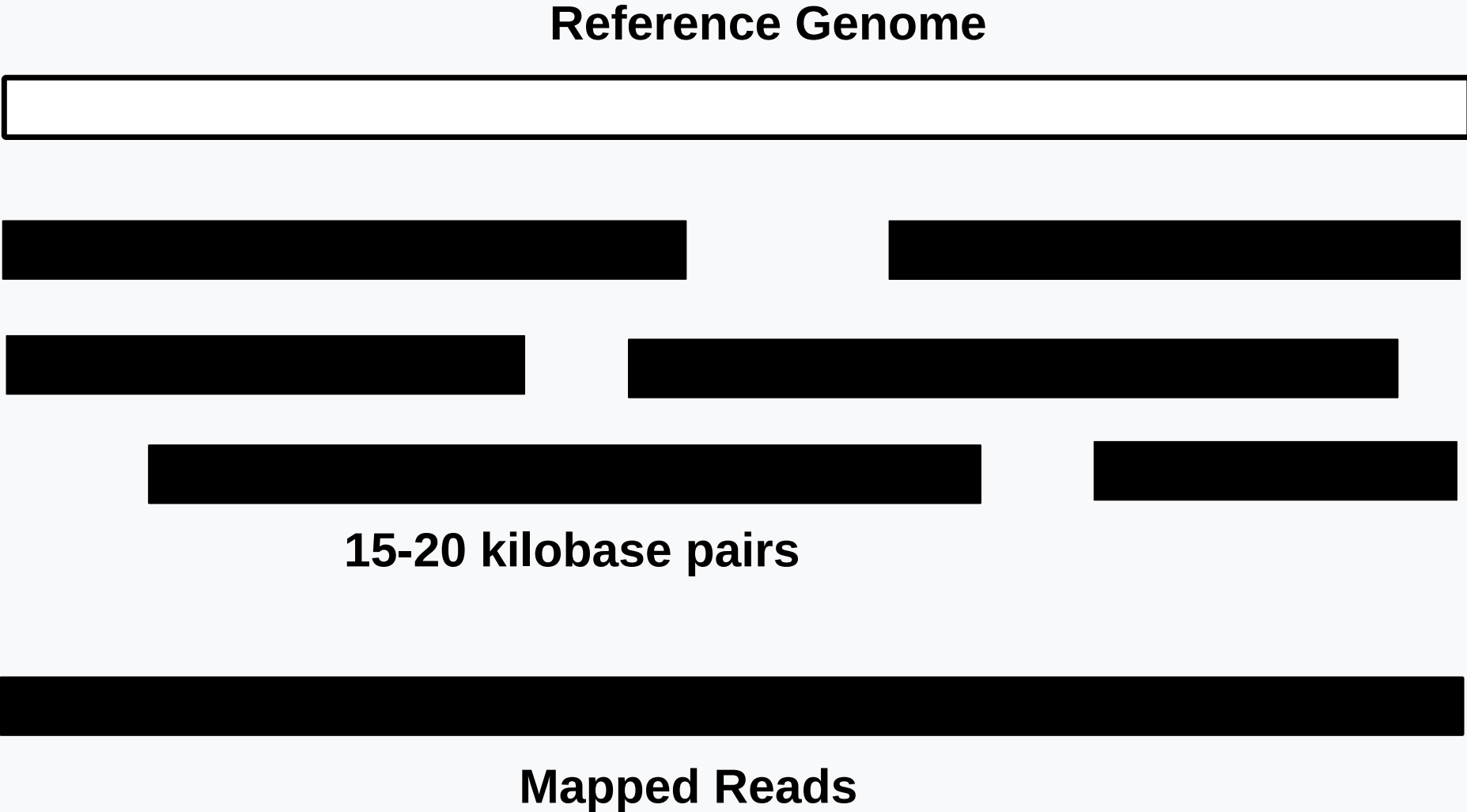
Reference Genome



Long read whole genome sequencing



Long read whole genome sequencing



Biobanks we have access to

All of Us Participants with:

EHR data
493K

HLA
390K

Short read WGS
414K

Updated:10/15/26

All of Us Participants with:

EHR data 493K	HLA 390K	Short read WGS 414K
Long read WGS 14K	Bulk RNA-seq 9K	Proteomics 10K

Updated:10/15/26

BioVU

Participants with:

EHR data
4.2 million

HLA
249K

Short read WGS
249K

Updated:10/15/26

BioVU

Participants with:

EHR data
4.2 million

HLA
249K

Short read WGS
249K

Long read WGS
0

Bulk RNA-seq
0

Proteomics
0

Updated:10/15/26

UK Biobank

Participants with:

EHR data
230K

HLA
490K

Short read WGS
500K

Updated:10/15/26

UK Biobank

Participants with:

EHR data 230K	HLA 490K	Short read WGS 500K
Long read WGS 0	Bulk RNA-seq 0	Proteomics 54K

Updated:10/15/26

Questions and Thank you!

HLA

All of Us 390K

BioVU 249K

UK
490K

Biobank

Skills

- Immunogenomics
- EHR phenotyping
- Bioinformatic data analysis

Contact

matthew.s.krantz@vumc.org

